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VIEWS, NEWS AND INTERVIEWS.

The greater part of the mica produced in the United States is found in North Carolina. It is obtained from pegmatite dikes, in which mica occurs to an extent of not over one or one and one-half per cent, an average being one-tenth of one per cent. Of the amount mined, only five per cent is merchantable in sheets, while the remainder is ground and enters into composition with other substances. Mica deposits are also found in New Mexico, where the pegmatites are associated with granites at the base of the Grand Cañon series.

Armour & Company propose to expend $750,000 in the erection of a mammoth power-house on Packers avenue, between Forty-third and Forty-fourth streets, Chicago. The company will concentrate its power business there, using steam and distributing by means of electricity. In the present power plants there are 36 engines. The building will be 200 by 200 feet, one story, and with a height of 60 to 70 feet, galleries and other accommodations being placed where necessary. Two smokestacks 225 feet high are being constructed.

A party of 25 students from the electrical engineering department of Columbia University arrived in Schenectady, N. Y., recently, to spend a couple of days in practical study at the General Electric works. They were accompanied by professors W. H. Freeman and George H. Sever. They went to Mechanicville to see the power station there.

Rome proposes to have a subway through the Quirinal hill to the slopes of the Viminal and Esquiline. The tunnel will be 53 feet wide, with tracks for carriages, electric cars and foot passengers. An electric street railroad from the Porta del Popolo to the Porta San Giovanni will pass through it. The engineers state that it will take only seven months to build the tunnel.

In regard to electric traction in Japan the Tokio correspondent of the *Electrician*, of London, says in part: "There are only six tramways, including the three lines now under construction, and one of these is run in connection with a mining undertaking. The reason is that the local authorities find it either dangerous to have such rapid transit in their narrow streets, or object to the unsightliness of the overhead trolley lines, while both the conduit and accumulator systems are expensive. The future of electric traction is very hopeful, not only within the towns, but also in suburban districts, especially where water-power is available. It is reported that an American named C. T. Yerkes is forming a syndicate, with a capital of $10,000,000, for the purpose of covering Japan with a network of trolley lines. The rumor is not credited in Tokio."

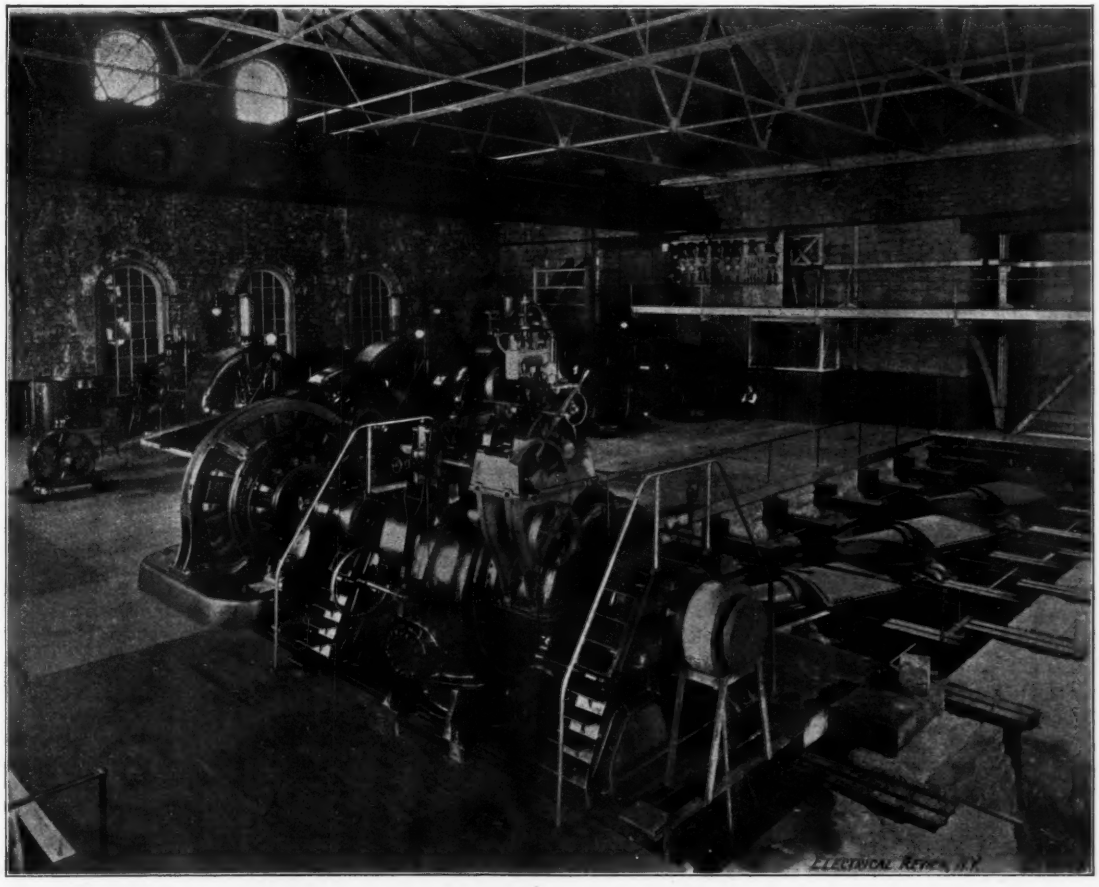


FIG. 1.—INTERIOR VIEW OF THE NEW GENERATING STATION OF THE NIAGARA FALLS HYDRAULIC POWER AND MANUFACTURING COMPANY, AT NIAGARA FALLS, NEW YORK.

THE STATION OF THE NIAGARA FALLS HYDRAULIC POWER AND MANUFACTURING COMPANY.

BY ORRIN E. DUNLAP.

Not the least interesting feature of the power development at Niagara Falls is the central station of the Niagara Falls Hydraulic Power and Manufacturing Company. In this station wheels are found working under the highest head of any at Niagara, and the installation has been so successful from the start that the company has ever since been engaged in adding to its capacity. The power-house of this company is located in the gorge at the water's edge, and the supply of water for the turbines is conducted from the upper Niagara River to the edge of the bluff through a surface canal. In length this canal is about 4,400 feet. At the entrance it has a width of 250 feet, but in the first 400 feet of its length it narrows down to 100 feet, and still further down until it has a width of about 70 feet. The canal channel for 30 feet of this width is eight feet deep, and for 40 feet it is 14 feet deep. The canal runs right through the heart of the city, and the 14-foot channel is on the north side of the waterway down to Third street, at which point it crosses over to the south side. The water of the canal empties into a basin about 400 feet long and 70 feet wide, which runs parallel with the edge of

the cliff and about 300 feet back from it. From this basin the water used in the company's central station is conducted to a forebay at the edge of the bluff by two connecting canals, one of which was constructed last Fall. The first connecting canal built has a width of 16 feet and a depth of 20 feet. The new connecting canal or inlet has a width of 21 feet and a depth of 19 feet. The forebay is about 180 feet long, 30 feet wide and between 19 and 20 feet deep. The walls of the original sections of the forebay and inlet canals are built of masonry, but in the construction of the new inlet and new section of the forebay concrete was used, some portions of the walls being rock-faced. The claim is made that this wall is the greatest of its kind in the country. It was built in sections and is most substantial.

From the forebay two penstocks extend to the power-house below, and through them the water passes to the wheels. The smaller of these two penstocks is eight feet in diameter, and is made of steel having a thickness of five-sixteenths of an inch at the top, and fifteen-sixteenths of an inch at the bottom. In its descent it hugs the cliff. Leaving the forebay it runs horizontally 25 feet to the edge of the bank, then drops vertically 135 feet to a solid foundation on the Niagara limestone, and from this point it runs at an angle of 45 degrees to the power-house. Beneath the power-house floor the penstock is suspended in the tail race, and runs horizontally about 70 feet. It is from this penstock that the four turbines of the original installation are fed. These four turbines were made by James Leffel & Company, of Springfield, Ohio, and are known as their Niagara type of wheel, which is their double-discharge wheel, in form and detail especially adapted to this plant. This type consists of a large, flattened, vertical, circular casing, containing the guide-case of the wheel and the wheel proper. Into this exterior casing the water is admitted underneath, flowing upwards, and surrounds the guide-case, being admitted to the runner through a series of oscillating guides, which constitute also the gates. From the sides of this casing project the discharge pipes laterally and then downwardly, by a gradual curve, to which draft tubes are attached, of 20 feet length, thus utilizing in part the atmospheric pressure. The heads of the large casing are of curved form and shape to secure strength, and are made of cast-iron three and one-half inches thick, while a circular band of steel plates, three-fourths of an inch thick, double riveted to the cast heads, constitutes the straight or cylindrical portion of the case. Within this casing and the guide casing is located the runner, or wheel proper, upon a horizontal shaft, supported by adjustable ball and socket oil bearing, upon heavy arched iron bridge-trees, exterior to the outer casing. The runner is 74 inches in diameter and composed of bronze and iron. The shell comprising the buckets proper, which receive the water by a sharp dividing diaphragm, or ridge, is bronze, and the central portion, upon which the shell is rigidly fastened, is iron, the runner being very heavy and substantially built. The wheel discharges the water laterally into the receiving or discharging pipes, and, on account of its peculiarity of design, there is no uncompensated pressure upon any part of the wheel, and therefore no end thrust or pressure endwise upon the shaft, but the whole is perfectly balanced, wherever it comes in contact with the water. The gates are made of the best of steel and are of the Leffel balanced pattern, and are operated by their patented double-ring arrangement, which is easily within the control of a hand-wheel, operated by one person. To the hand-wheel shaft the automatic mechanical governor is readily attached. Three of these turbines operate six generators that supply power for the lower works of the Pittsburg Reduction Company, located on the cliff top, and to these wheels no governors are attached. The fourth turbine supplies power for the operation of the Gorge Road, also for motor purposes throughout the city. This wheel has a Lombard governor attached.

This original installation was hardly completed before the Niagara Falls Hydraulic Power and Manufacturing Company began an addition to the power-house, so that its present dimensions are 120 by 100. The building is of stone with steel truss roof, and a further extension is contemplated. In the second section of the power-house it is the company's intention to install five wheels, and the first of them is in operation. This wheel receives its water supply through what is said to be the largest penstock in existence. It is over 11 feet in diameter, and was made by Struthers, Wells & Company, of Warren, Pa. The steel in it varies from five-sixteenths to one and one-eighth inches in thickness. A novelty of this penstock is that it stands out from the cliff in column form. It leaves the forebay in an elliptical bell mouth of 20 by 11 feet, and for 60 feet it extends out horizontally, supported on two iron girders. It then drops vertically about 200 feet to the power-house, under the floor of which it passes. For a distance of 50 feet beneath the floor the penstock has a diameter of 13 feet, and then it reduces until it is about seven feet, tapering finally in a cone 18 inches in diameter, ending in an air chamber 15 feet high and four feet in diameter. As it passes beneath the floor there are along its course five 60-inch valves to which the wheels will be connected, as stated, one being now in use. In the tailrace this new penstock is supported on a series of posts and beams, all adjustable by means of a series of keys, after plans made by W. C. Johnson, who is the company's chief engineer.

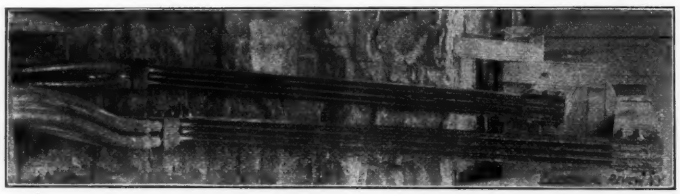


FIG. 2.—CONNECTION OF ALUMINUM BARS AND CABLES AT TOP OF CLIFF ABOVE NIAGARA FALLS HYDRAULIC POWER AND MANUFACTURING COMPANY'S POWER PLANT.

The first turbine placed in this new section of the station was made by R. D. Wood & Company, of Philadelphia. It has a capacity of 2,500 horse-power. It is known as the Jonval-Geyelin improved type, and in its general construction very closely resembles the wheels built by the same makers for the Niagara Falls Paper Company. The head under which it is operated is about 210 feet. In the illustration of the power-house interior, Fig. 1, this wheel is shown in the foreground. It has a large circular casing in which the wheels proper are located. The water is admitted underneath and flows upward to the guide wheels through a gate and then to the runners. The discharge pipes project laterally from the sides of the casing and then downwardly. The heads of the casing are made of cast-iron, one and three-quarter inches thick, and have heavy two and one-half inch by six-inch ribs at the bottom. The casing weighs about 10 tons, and the total weight of the wheel is about 21 tons. Its foundation is a pair of 24-inch I-beams. The bronze wheels are located in the draft tubes, one on each side of the casing proper, on horizontal axis, and direct-connected to the generator. Special care was taken in designing this turbine, owing to the great pressure on the component parts, and especially on the gates, which are planned on a slide-motion principle and are counterbalanced; a simple but effective method of overcoming the enormous pressure which would act on each individual turbine gate. The gate is operated by a walking beam, which works over the top of the casing proper. The Reynolds governor is attached.

It is the intention of the company that this turbine shall operate two generators, but as yet only one of them has been attached. This generator was built by the General Electric Company and supplies the current for the operation of the new chlorate of potash plant of the National Electrolytic Company on the high bank. The machine has 14 poles and makes 250 revolutions per minute. Its output is about 5,000 amperes at 175 volts, or a capacity of 875 kilowatts, nearly 1,200 horse-power. The type is quite large and is direct-connected to the turbine. The other generator to be connected to this turbine is now being completed by the Walker Company, and when installed it will form part of the equipment of the Buffalo & Niagara Falls Electric Light and Power Company. It is to be an alternating-current dynamo of 700 kilowatts output capacity, at 2,200 volts pressure, 125 cycles per second, when operated at 250 revolutions per minute. This machine will be installed under the supervision of Frank G. Lott, who is the manager of the Buffalo & Niagara Falls Electric Light and Power Company, as well as the electrical superintendent of the Niagara Falls Hydraulic Power and Manufacturing Company.

In the illustration, Fig. 1, it will be seen that a gallery has been erected in the rear of the machines, and on this gallery the switchboards are located. They are equipped for controlling the various currents.

The gate house of this plant is located over the forebay on the top of the bank in the rear of the aluminum works. This gate has a steel frame and is covered with corrugated iron. The style of gate used in the new section is practically the same as in the old section. There is a series of racks designed to screen the water in order to prevent floating substances liable to injure the wheels from entering the penstock.

In this installation aluminum conductors have been adopted to carry the current from the generators to the aluminum works and also to the National Electrolytic Company's plant. From the original section of the power house to the aluminum

works two aluminum cables, each having 250 strands, are run up the inside of a tower, but from the new generator to the chlorate of potash works aluminum bars are the conductors. These bars are 25 feet long, six inches wide and half an inch thick. Four are placed in parallel. Every 25 feet the bars are bolted and riveted together and extend up the outside of the big penstock, on which they are supported by brackets, seven of which are attached to the side of the penstock. At the top of the cliff the bars are connected to aluminum cables, as shown in the illustration, 12 cables being used on each leg. These cables are about one and one-fourth inches in diameter and made of wire about the size of No. 10. Castings which contain sockets are used to connect the ends of the bars and the ends of the cables. In these melted tin is poured about the ends, thus making a solid and permanent joint. In the last installation about 22,000 pounds of aluminum were used, it being estimated that the same work in copper would require about 48,000 pounds, the weight of which would be a factor of considerable consideration on the side of the penstock.

All the work of the Niagara Falls Hydraulic Power and Manufacturing Company is done under the supervision of Wallace C. Johnson, member of the American Society of Civil Engineers, who is the chief engineer of the company. Under his direction many valuable improvements have been made from time to time on the company's plant.

This year the ice in the canal has been more troublesome than in any previous time in the company's history. From time to time men have been very busy blasting the ice in order to keep the channels open.

American Institute of Electrical Engineers.

The regular monthly meeting of the institute was held at 12 West Thirty-first street, New York, on Wednesday evening, February 15 (a week earlier in the month than usual, on account of the regular date falling upon Washington's birthday).

A paper was read by Robert McA. Lloyd, entitled "Storage Batteries and Railway Power Stations." It was discussed by Messrs. Hill, Mailloux, Birdsall, Coho. Smith, Holmes, Henshaw, Bijur and others

A meeting of the western members was also held on the same evening at the rooms of the Technical Club, 228 South Clark street, Chicago, where Mr. Lloyd's paper was also read and discussed.

At the meeting of the executive committee in the afternoon, the following associate members were elected:

Frank Pierce Adams, Julius Le Roy Adams, Paul K. Browd, N. M. Currie, John Sturges Codman, Clifford E. Dunn, Charles William Hutton, Edmund Oscar Schweitzer, Arthur E. Truesdell, Marcus B. Waterman, John Shreeve Wise, Jr.

Mr. George T. Hanchett, consulting electrical engineer, New York city, was transferred to full membership.

William E. Baker Appointed Chief Engineer of the Manhattan Railway Company.

William E. Baker, of Chicago, has been appointed general superintendent in charge of the operating department and chief electrical engineer of the Manhattan Railway Company, of New York city. He takes general charge of the road at once, relieving vice-president and general manager Alfred Skitt of a large part of the detail work which has fallen upon him. It is understood that Mr. Baker will have complete supervision of the installation of the proposed electrical equipment.

After graduating from Lafayette College in 1877 Mr. Baker was employed on the engineering staff of the St. Paul & Pacific, the Northern Pacific and the Canadian Pacific railroads. He was with the first parties who surveyed the present route of the Canadian Pacific. He spent two years in the Rocky Mountains with these parties. He was for a time in Texas as the resident engineer of the International & Great Northern.

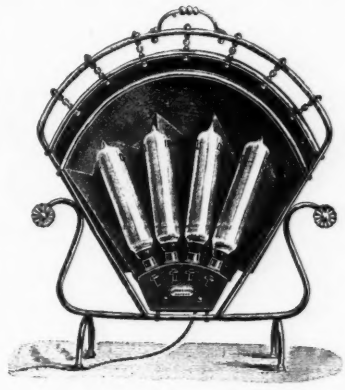
He went to Boston in 1888 and became associated with the Thomson-Houston Electric Company, and remained there until 1892. His first electrical work of any moment was the installation of the electrical

FIG. 3.—ALUMINUM CABLES RUNNING UP A TOWER FROM POWER STATION TO PITTSBURG REDUCTION COMPANY'S PLANT.

equipment of the West End Street Railway, of Boston. In 1892 he went to Chicago, and during the World's Fair had charge of the construction and operation of the Intramural Railway, which was the first application of the third-rail system, afterward applied to the operation of the Metropolitan West Side Elevated Railroad in Chicago. Since 1894 Mr. Baker has been employed in constructing and operating the system of the last-named railroad as general superintendent.

A Luminous Electric Radiator.

Heretofore electric radiators have been of a non-luminous character, similar to hot water and steam radiators, and this fact has somewhat limited their use. The system of warming the air only of a room is not approved in England, where the open



A LUMINOUS ELECTRIC HEATER.

fire is most appreciated. With the new luminous electric radiators, shown in the illustration herewith, from the London *Electrical Review*, intense heat is radiated (as from a gas or coal fire) into the room with the considerable advantage that no combustion takes place, that no fumes are created, no flue is required, and the heat is available immediately the current is turned on. These are advantages which are not found in any other form of heating apparatus. The luminous electric radiators waste no electricity: all is turned to heat, and the general effect is that of warm sunshine. The heaters are made on the principle of electric incandescent lamps, and have carbon or high resistance metals enclosed in hermetically sealed glass protectors, from which the air is exhausted. The heaters, when used in conjunction with the patent reflectors, produce a considerable current of heated air besides radiating heat into the room. It is stated that they last a considerable time, usually much longer than incandescent lamps. They can be turned on and off at will, and no heat is lost in warming up or cooling down. Considerable saving in current is thus effected. These electric heaters can also be used for other domestic purposes where radiant heat is required, such as roasting (not baking), grilling, toasting, warming food, airing, heating irons, and many other applications. The great advantage in all this is that the heat is immediately available, and as the intense heat rays pass direct to the object, there is little lost in heating the intervening air. Hence it is claimed that in all applications where radiant heat is required a far higher efficiency can be attained by these luminous heaters than with any other forms. The illustration shows a type which has an ornamental brass frame, patent copper reflectors, four luminous heaters, with switches. The current consumption is one-fourth unit for each heater per hour, hence one of these luminous radiators with four heaters will consume one unit of electricity per hour.

More Electric Cabs for New York City.

The Electric Vehicle Company, of New York city, is arranging to place orders for the construction of 200 more cabs. There are to be 25 of the ordinary coupé pattern, 75 hansom cabs, 50 full-extension broughams, seating four persons each, and 50 three-quarter extension broughams, accommodating three persons each, the last two being new styles of vehicles. All are to be delivered by June 1. A new building in Forty-second street, near Third avenue, is to be used as a construction and repair shop, and a charging station is to be built downtown and another on the east side, the company to operate 100 vehicles from each station.

OBITUARY.

The Hon. Lewis Miller, of Akron, Ohio, died at the Post Graduate Hospital, in New York city, on February 17. He was brought to New York to undergo an operation, but was delayed on the way, and as it was not performed in time, was not successful. Mr. Miller was 70 years old and one of the most prominent business men in central Ohio. He was one of the founders of the Chatauqua Assembly and was known throughout the Methodist Church. A daughter of Mr. Miller is the wife of Thomas A. Edison.

A syndicate composed of Moore & Schley, Emerson McMillin & Co., H. B. Hollins & Co., Wood & Havemeyer and John C. Tomlinson has secured control and will consolidate the gas and electric light properties of Denver, Colo. Two companies will be combined, the Denver Consolidated Gas Company and the Denver Consolidated Electric Light Company. The new company which will be organized will be authorized to issue $3,500,000 stock and $5,500,000 five per cent 50-year gold bonds.

MOTOR INSTALLATION AT THE CHICAGO "NEWS" OFFICE.

ABSTRACT OF A PAPER READ BEFORE THE CHICAGO ELECTRICAL ASSOCIATION BY CHARLES A. DRESSER.

In the newspaper plants equipped electrically previous to the installation of the Chicago *Daily News* plant, a single motor was used, either geared or directly connected to the main shaft of the press. This motor was controlled by an ordinary speed controller operated by hand and which presented many of the difficulties of the old friction-clutch mechanical method, inasmuch as it requires two operators, one to control the movement of the press and the other to put on the plates.

At the *Daily News* each press is equipped with two electric motors. The first motor being a five-horse-power six pole motor, having a maximum speed of 200 revolutions and suspended on the press at right angles to the main driving shaft. On the shaft of this motor is an automatic friction clutch and worm which engages with a brass gear wheel situated on the main shaft of the press. The maximum speed of the press at the maximum speed of this five-horse-power motor is 10 revolutions per minute. It will be readily seen that by the use of a worm a direct thrust is avoided and an even steady motion is given to the gear, making it impossible to have any jumps or jerks. Each five-horse-power motor is operated from a speed regulator which has mounted on its face one compressed air cylinder and one dash pot cylinder and a contact lever, which is connected to both cylinders. At four different points on the press are located four-way compressed air cocks, which are in turn connected by piping to the cylinders on the rheostat. These compressed air cocks are normally in a vertical position.

In starting the press the operator moves the compressed air-cock to the left, which admits air into one end of the cylinder and opens the other side: the air rushing in one end of the cylinder forces a plunger through the length of the cylinder; this plunger being connected to the contact arm, forces it over, cutting out the different steps of resistance. The dash pot being connected likewise to the contact arm retards the movement so as to cut out the resistance gradually. A valve in this dash pot regulates the speed with which this resistance is cut out and can be adjusted to give any desired rapidity of cutting out resistance. In cutting off this motor the operator moves the four-way cock to the right, thereby reversing the pressure and also reversing the direction of the contact arm. By the manipulation of this air-cock it will readily be seen that the operator can move the cylinders on the press any desired distance, even down to one-sixteenth of an inch, and the greatest dexterity in the handling of this plant is acquired in a few hours' practice by the operator. Furthermore if the contact arm on the rheostat is on any desired speed point, by quickly placing the air-cock in the neutral position the pressure on both sides is balanced and the contact arm remains stationary.

The main power for each press is derived from a 40-horse-power slow-speed multipolar motor geared to the press by a single reduction gear and located under the press in the basement of the pressroom. This motor is set on two sliding rails placed on brick piers; a single reduction gear being used, so that the motor can be quickly disengaged from the gear and any necessary repairs made, it being essential in the operation of a newspaper to have quick action in case of accident. Each 40-horse power motor has a commutated compound field which gives the motor a great starting torque. These sections of the compound field are cut out as the motor speeds up. Under ordinary running conditions the motor operates as a simple shunt motor. The armature is of the two-circuit series wound type and but two sets of brushes are necessary. Each motor is controlled by a 40-horse-power speed-regulating rheostat having 55 contact points. On each press are situated nine push-button stations conveniently located, consisting of two compressed air valves and one electric push-button.

The rheostat arm for the large motor revolves in a circle over the rheostat points on a shaft which extends through the rheostat to the rear, where a pinion is placed on the end of the shaft, engaging with a rack which moves in a vertical direction up or down, according to the direction desired for the rheostat arm. On the end of this rack is a plunger which fits into a cylinder. This cylinder is between two other cylinders of equal size, connected with the air supply in such a manner as to leave the pressure always equally balanced unless an exhaust is introduced. In these three cylinders is as much water as the capacity of two cylinders. Floating on this water in each of the outside cylinders is a rubber ball, which acts as a check valve, as hereinafter described.

Now, assuming that the rheostat arm is on the first contact point, and we wish to start the motor, we press the "on" button and exhaust the air from the right-hand cylinder. The pressure being on the end of the opposite cylinder forces the water downward through the left-hand cylinder through the central cylinder and up into the right-hand cylinder, until the rubber ball in the left-hand cylinder is forced by the pressure behind it into a valve seat at the bottom of the cylinder, thus preventing any further pressure on the piston. The ball in the right-hand cylinder, on the other hand, is forced upward into a valve seat, preventing the water from getting into the air pipes. In this operation the water from the left-hand cylinder presses the plunger in the central cylinder down, and the rack, engaging with the pinion of the rheostat shaft, moves the rheostat arm around, while on the other side of the plunger the water is forced before it into the right-hand cylinder. When all the water has been forced from one extreme position to the other extreme, the rheostat arm has traveled the entire circle and is on the last point, and all the resistance is cut out. By the operator removing his finger from the push-button, the air pressure in both outside cylinders is the same, and therefore maintain the rheostat arm in any position desired. This ability to maintain a constant speed on any point for the larger motor, during its operation of the press, is one of the most important features in the handling of a large newspaper press. With the old mechanical drive, the maximum speed is the only speed possible after the press has obtained its momentum.

If it is desired to slow down, the same operation is accomplished by pressing the "off" button, which reverses the flow of pressure and water, and accomplishes the desired result On the face of each large rheostat is a main-line switch on a pivot. The terminals of this switch are so arranged that a straight line drawn from the contact point to its opposite; i. e., two straight lines drawn from the contact points would form an X. When the switch is closed the left side is up and the right side down. Attached to this switch on each side of the pivot are two springs, one operating up, the other down, which tends to pull the switch open. The switch is normally held in position by a dog, which is the armature of the magnet. This magnet is in series with the field, but the current is short-circuited around each through a mercury cup. On this cup is a solenoid, which is energized by a motor-generator. This motor-generator is in series with the electric push-button at each push-button station; when the circuit is broken by pressing one of these buttons this solenoid is cut out and the contact is broken by means of a spring, and the current is diverted through the magnet on the rheostat. This magnet attracts the armature, releases the main switch, which is pulled to the opposite position by the springs already described. In breaking the circuit and arriving at the stops, the switch opens a compressed air valve similar to the "off" button, which forces the rheostat arm around to the starting position. When the rheostat arm reaches the starting position it opens a second compressed air valve, which operates a little auxiliary cylinder similar to the one on the small rheostat, which forces up a piston rod and locks the main-line switch, the piston returning to its normal position by means of springs attached to piston which draw it back, leaving the resistance all in and the motor ready to be started again by pushing the "on" button.

On each press, just at the point where the paper is fed into the press, are two tension rolls which have a lateral motion of about two inches on an inclined plane. The paper nominally by its own strength holds these tension rolls at the upper end of this incline. On the right-hand supporting bracket of each tension roll and at the lower end of this incline is located an electric button similar to the emergency stop at the push-button stations. If by any accident the paper is broken the tension roll is released, rolls down this incline, touches the emergency stop and immediately shuts down the press. This simple little device makes it absolutely impossible for the paper to become jammed and clogged in the press and saves much trouble and annoyance and absolutely does away with any supervision or delay ordinarily necessary when a press is shut down by hand power.

In the basement are four enormous reels, each capable of holding four rolls of paper weighing 2,000 pounds, each designed so that it is not necessary to shut down the press every time the roll is changed, as by the old method. On each of these reels is geared a two horse-power reversible, series-wound motor, governed by a brake and in circuit with a double-pole, double-throw switch. No rheostat is used with these motors, but when a roll is exhausted and it is necessary to turn the reel to bring another roll of paper into use, this switch is thrown in according to the direction in which it is desired to move the reel, and the roll brought to its proper position. Now, assuming that one roll is being rolled off through the press, the end of the second roll of paper is brought up through the floor and attached by little tacks. When the first roll is finished a boy puts paste on the end of this new roll and has it ready for action. When the time arrives for changing from one roll to another the "off" button is pushed, the motor slowed down, until the press is at about one twentieth of its maximum speed, then the boy takes the end of the paper, quickly slaps it on the old roll, the paper is carried on as if it were one continuous roll, and in the space of less than half a minute the press is again operating at full speed and turning out 16-page papers at the rate of 24,000 per hour.

Now assuming that there is no paper in the press and that there are no plates on the cylinders, the first operation is the putting on of the plates, which are brought in through the basement and shot up on a small elevator to the press floor. The operator has his hand on the compressed air-cock of the small motor, he shouts "look out," gives the compressed air-cock a slight turn and his cylinder is in position to receive the first plates. These are put on and firmly bolted; he is then ready to give the cylinder a half turn to receive the opposite plates; he again works the compressed air-cock until he brings the cylinder into the proper position; this operation being repeated as many times as is necessary until all the cylinders on

the press have received their equipment of 32 plates.

The next step is to thread the paper. Two men take the end of the thin sheet, pass it around the first two rollers, then over the tension roll and from there into the various intricate twists and turns in the press which is now revolving at full speed when operated by the small motor; viz., 10 revolutions per minute. The paper is gradually taken through until we see the folded papers coming out at the finishing end. The pressman examines the paper to see that it is properly printed and that the pages are in regular order. This being demonstrated, he is ready to run off his paper. Again he cries, "look out," the press and motor being already in operation, the small motor doing the work and the large motor being mechanically driven by its engaging gear on the press shaft; there is therefore no inertia to be overcome, there is no starting a large piece of machinery from a dead standstill and the consequent influx of current. We press the "on" button, the large rheostat arm begins to revolve, and when it arrives at the point of starting of the motor electrically there is an even acceleration of speed from this point, the automatic friction clutch on the small motor shaft is disengaged, the small motor has then finished its work, and is stopped, and the big machine begins to hum. By the operator's keeping his hand on the "on" button he can attain any desired speed for the press up to the maximum. From this time forth everything is noise and racket, and papers are piling out and being carried away by the automatic carriers, and within a very few minutes are distributed on the streets by the newsboys.

Too much credit can not be given to Mr. Irving Stone, mechanical engineer of the *Daily News and Record*, who, by his progressive ideas and great ingenuity and his untiring efforts to assist the contractors with his practical ideas, made this plant possible. Mr. Stone has many other original devices in his press-room, among which his automatic compressed air governor, which regulates the tension of the paper, and his automatic paper carriers might be mentioned.

In general Mr. Stone states that his apparatus requires a minimum of attention and gives a maximum of results; the saving in labor alone amounting to a large sum each year. The output of the press is increased 20 per cent over the old mechanical drive, and in running off an edition these two presses can give 20 minutes start to any other two presses in the building, the latter being operated by more men, and can beat them out on the edition. In case of a slight accident, where the presses start at the same time as the old mechanical drive presses, it will be seen that they can gain the time lost with ease. There is no breaking of paper, no clogging up, no confusion and no injuries to men, and when an edition is started on either one of these two presses it is always finished ahead of time.

Goddard's Statue of Gutenberg.

In the illustration herewith is shown a heroic statue of Gutenberg, father of the art of printing. The statue is the work of Ralph Goddard, of New York city, a young sculptor of talent who has recently returned from several years' study in Paris. Mr. Goddard is a brother of Mr. Stephen H. Goddard, advertising manager of the ELECTRICAL REVIEW and for several years a member of the editorial staff of this paper.

GODDARD'S STATUE OF JOHANNES GUTENBERG, THE INVENTOR OF PRINTING.

The proportions of the statue indicate that it is heroic, giving the illustrious German a height of over seven feet. Its features and pose are as correct in an artistic sense as lifelike from a technical viewpoint. The inventor is shown with, in his left hand, a stick or similar contrivance for the assembling of his movable types, and his glance seems to take in at the same time the proof that he holds in his right hand. As soon as cast in bronze, the statue will be placed in the façade of the very substantial new building in New York city of R. Hoe & Company, on whose order the commission was executed.

Experiments With Kite Electric Collectors.

TO THE EDITOR OF ELECTRICAL REVIEW:

In my experiments with copper wire, bare of insulation, festooned to my kite cable, and connected to a tinfoil coated rectangular piece of cardboard, I found that if I sent up the cardboard with its edge cut into saw-like teeth, or points, of which there were 46, the length of the spark drawn to an iron stake driven into the ground was abnormally small. I had one wire leading from the collector, which was suspended at a height of about 600 feet, extending down the kite cable and into the second-story window of my house, where it was connected to a glass cylinder and a Leyden jar, both coated with tinfoil, inside and out. The outside coating of the jar and of the glass cylinder were connected to a grounded wire, fastened to an iron pin. The length of the spark was measured roughly by the eye and was drawn by bending wires extending from the inside to the outside coating of the glass cylinder. Of course the length of the spark varied with the height of the collector—the higher the collector, the greater the electric tension. This variation in height was caused by the rising and falling of the kites, due to variations of wind velocity. The smallness of the sparks, resulting from the saw-like collector, convinced me that the general system of fitting lightning-rods with points is a good one, because the experiment demonstrated that points dissipate electric tension silently. As I wanted the greatest spark length possible I substituted a large Leyden jar of pasteboard with an open cylindrical top, and at once found that I obtained a larger spark than I had ever seen at the height to which the pasteboard Leyden jar was hoisted, about 400 feet. Franklin's experiment in 1752, with the metal point on top of his kite, had given me the idea that points would increase the spark length, whereas the reverse is the case. The thunder-storm had so overloaded Franklin's wet kite string with electric force that he obtained what Dr. Lodge, of England, would call "the impulsive rush" of electric force, in which either points or knobs would cause strong sparks. My conditions were different, in that I was drawing electric force from a clear sky. I believe that had Franklin hoisted his Leyden jar up into the air with a series of large tandem Eddy kites, as I did, he would have attained even more powerful sparks of greater length and frequency. WILLIAM A. EDDY.

Bayonne, N. J., February 14.

Electrical Review

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All honor to the state of Minnesota! The proposal to inflict the death penalty in that state by electricity met with the prompt defeat it deserved. New York, Massachusetts and Ohio are the only states that permit the infliction of the death penalty by barbarous electrocution.

The electrical industry as a whole is in a very prosperous condition, and trade reports indicate an increase rather than a diminution of business.

We call the attention of our readers to the very complete description, published in this issue of the ELECTRICAL REVIEW, of the new generating plant of the Niagara Falls Hydraulic Power and Manufacturing Company. An interesting feature of this plant is the use of aluminum cables and bars as conductors.

The newest fad seems to be the holding of banquets in cities far apart and hearing speeches by telephone. Several instances of this new practice have recently occurred, among others being a collection of three banquets in St. Louis, Chicago and Boston. Speeches made in each of these cities were heard by diners in the other cities.

A very interesting surgical operation was performed recently in Lynn, Mass., by the aid of the X rays. It was a case of a hidden and decayed wisdom tooth which had grown so that it was entirely covered by the adjacent bone and tissue. A radiograph located the trouble at once, and by a simple surgical operation the offending tooth was quickly removed.

Critics who make remarks about the closing down of the underground trolley roads in New York city during the recent blizzard should remember that the electrical apparatus, both at the power stations and on the cars, stood up to its work, and in no sense was responsible for the failure of the operation of the road. The whole trouble was due to track causes. The storm was so violent that it was a physical impossibility to keep the tracks clean, or anywhere near clean.

According to the daily papers, an enterprising pair of burglars tackled a bank safe at Oberlin, Ohio, in approved modern style. They tapped a trolley wire near the bank and hitched up a portable electric drill they carried with them. Then they bored a hole in the safe door, inserted an explosive and blew the safe to bits. But they secured no booty, as they were frightened away. Thus it is shown that technical and electrical skill does not always achieve success.

Clarence I. Spellman, of Kansas City, Mo., has asked the Circuit Court for an order compelling the Missouri & Kansas Telephone Company to permit him to inspect its books. He has sued the telephone company to compel it to furnish him a telephone at $3 a month, instead of $6, the rate now charged. If Mr. Spellman's motion is sustained the telephone company will have to make public the amount of money it makes, the salaries it pays and many other matters of a private and business nature. Suppose the parties to the suit were in reversed positions, would Mr. Spellman be willing to ventilate his personal business affairs in court or elsewhere?

Several favorite telephone sayings received striking illustration during the blizzard from which New York and its suburbs are just now recovering. The telephone people have for some time past been offering pointed advice to the public, reiterating a phrase that has almost become a by-word, "Don't travel, telephone." During the recent blizzard it was a case with a large majority of people having affairs in New York of "Can't travel, telephone." And the telephone service stood up nobly to the exceptional test that was made of its capacity. Early this Winter the announcement was frequently made in print that New York telephone service is blizzard-proof. The event has proved the truth of the assertion.

We conclude in this issue a very interesting paper by Lieut. S. Dana Greene, entitled "Electricity on Board Ship." In considering this important question, Mr. Greene makes a valuable point, which every electrical engineer who has to do with marine installations, especially aboard men-of-war, should constantly keep in mind. It is this: "A ship is built to keep the sea, and her efficiency and usefulness are measured by her performances at sea, and not when incidentally or accidentally in port. Her weights are distributed and apportioned, and her power, speed and 'steaming radius' are designed for sea conditions, and it is these conditions alone which should be considered."

WALL STREET AND THE ELECTRICAL STOCK MARKET.

As compared with the closing prices of last Friday, the majority of stocks finished the current week at higher prices. During the week there was a renewal of the advance in the market, which surprised many competent observers of present conditions. The latest trade statistics show no lessening of business in any line and continued improvement in many fields. The export trade continues strong, especially in the copper market.

On the New York Stock Exchange General Electric closed to-day at 112 bid and 112½ asked, a gain of 1½ points for the week. Edison Electric Illuminating of New York closed at 196 bid and 198 asked, a gain of one point for the week. Metropolitan Street Railway, of New York, closed at 244¼ bid and 244¾ asked, a rise of 10¼ points for the week.

The directors of the General Electric Company, at a recent meeting declared a dividend on the preferred stock of $19.05⅔. This completes the accumulated dividend payments on the preferred and clears the way for action on the common stock. The books for this dividend closed on February 21, and reopen March 10.

On the Boston exchange American Bell Telephone closed at 371 bid and 372 asked, a rise of 23 points for the week and 54 points in two weeks. Erie Telephone was not quoted to-day.

On the Philadelphia exchange Electric Storage Battery common closed at 132 bid and 133 asked, a rise of 31 points for the week and 44½ points in two weeks. Electric Vehicle closed at 66 bid and 68 asked, a rise of 23 points for the week and 40¼ points in two weeks.

Notice has been given by Spencer Trask & Company and Vermilye & Company, in a circular letter to the stockholders of the Edison Electric Illuminating Company of New York, that, "owing to the illness of one of the counsel, the completion of the deposit agreement for the deposit of the stock of the company with the Central Trust Company has been delayed, and therefore the time has been extended from February 15 to March 5." The agreement is that by which the Edison stockholders agree to the sale of their company to the New York Gas and Electric Light, Heat and Power Company, the $25,000,000 company in which William C. Whitney and his friends are interested.

Wall Street, February 18.

NEW YORK ELECTRICAL SOCIETY.

194TH MEETING AT THE STATION OF THE ELECTRIC VEHICLE COMPANY, NEW YORK CITY, FEBRUARY 14, 1899.

The invitation of the Electric Vehicle Company to the New York Electrical Society to visit its station at 1684 Broadway, New York city, on February 14, brought together nearly 200 members and their friends.

It had been arranged that Mr. G. Herbert Condict should give a paper on automobile work, but as that gentleman was snowed in at Philadelphia, Mr. W. F. D. Crane, in his absence, gave an extemporaneous address on the subject. Mr. Crane said in part:

The body of the electric vehicle as it appears upon the wheels to-day is what we got from those who have gone before; it is a work of the past. The running gear below is a little more up-to-date. In this matter the engineer is confronted with the fact that he is trying to combine the old with the new.

One of the difficulties that must be faced in designing the mechanism to run the cab or carriage is the spring body. You must have a running gear, truck, wheels, axles, fairly rigid and stationary to receive your machinery and at the same time make all allowances for the spring motion, which contributes to the comfort of the rider.

The motors are placed upon the axle, two of them in a case, with the gear rigidly fixed upon the wheels. These wheels are not rigid with the axles, but are independent. The pinion upon the motor comes out and meshes with the gear which is attached to this wheel. The steering arrangement, as you may have noticed, is applied to the hind wheels. The axle does not turn with the wheels, but the wheels are arranged upon separate spindles which are hinged to the axle, which is rigid with the body attached to the springs.

The batteries are placed within the cab, either from the front or rear, dependent upon the character of the vehicle, whether a brougham or hansom. These batteries when shoved into the vehicle make automatic contact, so that the operator has nothing to do except to put the door over the compartment. The driver has everything within hand-reach or foot-reach at his side. With his hands he operates the controlling lever for operating the switch beneath his seat; he also steers with his hand. The braking is done with his foot, and he rings the bell with his foot. There is an emergency switch placed near his heel, by which he can throw out the switch and break the current in case it is necessary to do so. In order that no tampering with the vehicle can take place while he is absent, he can remove the lever, so that the machine can not run away if any one attempted to fool with it.

Mr. Condict deserves the greatest credit for the ingenuity he has shown in designing the various movements that you see below for the handling of these batteries, for, of course, the batteries, which take the place of horses, fuel, steam and all other methods of propulsion, are the essential elements in the whole problem—that is, to handle that heavy mass quickly, economically and satisfactorily. You will see the batteries picked up and carried around sideways, backwards and frontwards, as if they had no weight at all; but when you think of their weighing almost three-fourths of a ton, you can readily appreciate that it took some ingenuity and requires a great deal of strength in the batteries to handle them so quickly and easily. In street cars run by storage batteries, one of the early difficulties was to get the car to a position where you could put in the battery. The same thing occurred with the electric cab; but the difficulty has been overcome by that table which you see upon the floor, on which the cab stands. The table is split in two parts and balanced below, so that the parts are free to move in either direction sideways. The cab enters and takes its position on any part of that table, then levers forced by hydraulic cylinders on the sides come up and engage the hubs, and make the movement which forces the cab in a right line from the table, or make the side parallel with these levers. While this is going on, you have the jacks coming up under the floor of the table, also operated by hydraulic power, to raise the carriage to the level of the table. Meanwhile the batteries, which have been charging on the tables further on behind, have been brought forward by the crane. This operation there seems very simple. While the cabs are on the street they are using the charge which has been put in the batteries; when they come back they require a new charge. The cab or carriage as it enters upon this table is centered as described and raised to the proper level, and a hydraulic ram comes out, takes hold of the batteries and pulls them out so far that they are left on the table, which carries them sidewise. These batteries are then moved out of the way, and a set of batteries which have been charged and which are resting upon the table are brought opposite the opening in the cab, and the ram makes a movement forward and forces the batteries into the carriage. Then the set which has been exhausted is picked up by the jaws, carried down the length of the room and deposited upon a table, where they will be recharged and made ready for service next time.

The operation of the station here is certainly most fascinating. I think you could all come up here—you who are interested in mechanical problems—and sit upon this balcony several times a week and watch the loading and unloading take place, and find it always a matter of interest to you. There is a great deal to be improved upon, of course, although it would appear now as though the shortness of time required to load the vehicles could not be very much reduced. The other evening a cab came in, the old battery was taken out and a new one put in in one and one-fourth minutes. This is prompt work, and it would be impossible to unharness horses and harness them again in that time. That is one of the modern advances.

When the batteries are let down on the table, they are moved by automatic contact by jaws coming up on the side. On the battery-boxes are contacts which fit similar contacts in the cab and also the contacts upon these tables. As the battery falls the contacts are driven up on the side, and the contact is automatically made with the switchboard, and the charging takes place in the regular way.

The following members were elected at the meeting of the society held on the 14th inst.:

E. S. Keefer, Western Electric Company, Bethune street, New York city; Walter F. Wells, Manhattan Electric Light Company, Eightieth street and West End avenue, New York city; Robert O. Bacon, the Maintenance Company, No. 220 Broadway, New York city; Edward Heaton, No. 1 Ferry street, Port Richmond, S. I., N. Y.; Harry Robert Benda, No. 355 West Twenty-fourth street, New York city; Marcus B. Waterman, No. 179 Lefferts place, Brooklyn, N. Y.; J. A. Lynch, New York Telephone Company, No. 372 Pearl street, New York city; Barto V. Van Voorhis, 2d, Crocker-Wheeler Electric Company, Ampere, N. J.; Henry Drucker, No. 44 Vanderveer street, Brooklyn, N.Y.; Harry M. Ramsey, No. 1062 Lexington avenue, New York city.

Mr. A. L. Riker on the Horseless City.

A very interesting paper on "The Horseless City, or the Age of the Automobile," was read on February 17, before the Quid Nunc Club, of New York city, by Mr. A. L. Riker, president of the Riker Electric Company. The paper was accompanied by a number of lantern slides illustrative of various types of automobiles, including a great many worked out by the speaker himself during 15 years' devotion to this new and growing art. In spite of the inclement weather, there was an excellent attendance. Among those present and participating were Messrs. Chas. A. Terry, Frankland Jannus, J. K. Hoyt, Spencer Peets, T. C. Martin, Dr. Berkens and Prof. J. F. Kemp, of Columbia University. Several ladies also took part in the discussion, the paper eliciting a perfect fusillade of inquiries, showing remarkably how deep is the general and popular interest in this latest work in the field of transportation.

PERSONAL.

Gen. E. S. Greely, of New Haven, Ct., the well known electrical pioneer, was a visitor to New York city last week.

Mr. John T. Hunt, of Zimdars & Hunt, electrical manufacturers, of New York city, returned home last week after a short trip to Havana.

Mr. Ralph K. Beach, of the General Electric Company's railway department, has recently returned to New York city from a visit to Havana.

Mr. Samuel M. Bryan, of Washington, D. C., has resigned as president of the Chesapeake & Potomac Telephone Company, and is succeeded by Hon. Jere Wilson. Mr. Bryan, it is understood, will turn his attention to his large mining interests.

Among the recent visitors from the East to Chicago were Henry B. Cutter, president and manager of the Cutter Electric and Manufacturing Company, Philadelphia, and Henry Lloyd, general manager of the Electric Storage Battery Company, Philadelphia.

It is rumored that Capt. George N. Stone, general manager of the City and Suburban Telegraph Association, the local Bell telephone company, of Cincinnati, will be appointed general manager of the Cincinnati Street Railway Company, in order that President John Kilgour may have more time to devote to the finances of the company.

Fort Wayne Electric Corporation.

A despatch from Fort Wayne, Ind., dated February 16, said that the Fort Wayne Electric Corporation would go voluntarily into bankruptcy on the petition of its creditors.

Death of E. S. Carpenter.

Edwin Stanton Carpenter, assistant treasurer of the Westinghouse Electric and Manufacturing Company, died suddenly in New York city on February 16. He had been connected with the company for a number of years, and was highly esteemed by his associates. The funeral occurred in Pittsburgh.

Receiver for the Niagara Falls Gorge Road.

A press dispatch from Buffalo, N. Y., dated February 16, says that the Niagara Falls & Lewiston Railroad Company, otherwise known as the Gorge Road, has gone into the hands of a receiver. On the application of a majority of the directors of the road, Justice Childs granted an order appointing Joseph R. Megrue, of New York city, temporary receiver. Capt. John M. Brinker, one of the stockholders, and until recently president of the company, is reported as saying that the road did not make any money last year.

ELECTRICITY ON BOARD SHIP.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS JANUARY 25, 1899, BY S. DANA GREENE.

(Continued from page 98.)

3. Efficiency—Here the contrast is very striking in favor of electricity, surprisingly so to one who has not seen the actual economy figures of steam auxiliaries. Some data will be presented on this subject later on.

There remain the two important factors of simplicity and reliability to be considered. No one who has had experience with the modern, well designed and well insulated carbon brush generator or motor, can have any doubt as to its greater simplicity as compared with the steam engine. There are no joints to keep tight, no nuts or bolts to set up, no packing to renew, no cylinders to cut, and only two self-oiling bearings, as compared with a dozen or more oil cups on an engine. In fact, it is difficult to imagine a simpler piece of machinery than the modern dynamo. It seems like a return to elementary principles to discuss such a point; and yet many men aboard ship imagine the dynamo a most complicated affair, simply because they know nothing about electricity and think everything connected with it is mysterious and complex. This feeling is not confined to seafaring men, as we all know.

The question of reliability is a vital one, for no matter what the advantages with respect to safety, economy and simplicity may be, if the electric auxiliary can not be relied upon at any and all times to do its work, it is a failure and must be discarded. It must not only be able to work well under normal and favorable conditions, but it must also be able to stand a certain amount of abuse and neglect. Stress of weather and other conditions, particularly during a war, sometimes play havoc with the established routine of a ship, and the sailor's tools must not only be sound, they must be hardy. The normal conditions aboard ship are not favorable to ordinary electrical apparatus, as has been explained, but this simply means that apparatus for such work must be specially designed and built to meet these conditions. The ordinary motor would not last long under a street car; nevertheless, thousands of car motors are built and sold every year which run day in and day out with a remarkably low maintenance account. Similarly, apparatus for ship work must be specially insulated, a larger margin of capacity must be allowed, and in exposed places it must be thoroughly enclosed. Several years ago an English manufacturer asked permission to install an electric deck winch on the spar deck of a new cruiser, fitting out at Portsmouth. When the captain who was superintending the fitting out of the ship saw it, he gave orders to have the deck hose turned on the motor for 10 minutes, and then to operate the winch. The manufacturer protested and said that the motor was not intended to be abused in that way. "Then take it off the ship," said the captain, "for I can not guarantee that we will ship no seas during our cruise, and I want that winch ready for service whether we ship seas or not." The captain was quite right, the motor was taken off and a "rough and ready" steam motor substituted.

Experience alone is the final test of reliability, and fortunately we have some experience in our navy on which to rely. During the late war all of our regular war vessels were fitted with electric lighting plants, and many of the larger ships were supplied as well with certain electric auxiliaries; such as ventilating fans and ammunition hoists. Two of the "Brooklyn's" turrets were controlled by steam motors and two by electric motors. So far as I have been able to learn, from both official and unofficial sources, all the electrical apparatus on these ships stood the supreme test of battle admirably, and the officers of the "Brooklyn" are enthusiastic over the performance of the electrically controlled turrets. They report that with respect to ease of manipulation and fineness of control there is no comparison, but rather a contrast. This is high praise from competent authority, for the officers referred to had actual command of the turrets in battle and their judgment is not only unprejudiced and impartial, it is final and conclusive.

It is hardly necessary to say that electric machinery to be reliable must have reasonable care and attention from men who know something about it. The same is true of any machinery, and it is bad policy, as well as untrue, to say, as is sometimes said by those who should know better, that an electric motor requires no attention. Cleanliness is very necessary, and may be considered as a first essential to successful operation. It is astonishing to see how little has to be done to an electric motor if it is kept scrupulously clean; but this cleaning must be regular and intelligent. From what has been said it may safely be affirmed that electric machinery can be made as reliable on shipboard as any other machinery, and with this in mind we can turn to the question of efficiency, including weight of plant and first cost.

There has been very little data published on the performance of ship auxiliaries, but a valuable contribution to the subject appeared in the February, 1898, number of the *Journal of the American Society of Naval Engineers*, by Past-Assistant Engineer W. W. White, United States Navy, entitled, "Steam Consumption of the Main and Auxiliary Machinery of the United States Steamship 'Minneapolis.'" This vessel, as is generally known, is a first-class protected cruiser of about 7,500 tons displacement, with three screws (each operated by its own engine), and a trial speed of over 22 knots per hour. She represents the highest type of her class, and is in every way a credit to her designers and builders. She has between 30 and 40 steam auxiliaries, and more than 150 separate steam cylinders. Her only electric auxiliaries are the lighting generators and a few small ventilating sets and ammunition hoists. In order to ascertain the steam consumption of her main engines and auxiliaries, Mr. White, who was serving on board the "Minneapolis" at the time, as one of her engineers, made a series of careful observations during a run of the vessel of seven days from Gibraltar to League Island, Philadelphia. Indicator cards were taken on all auxiliaries fitted for the purpose (31 in number), and the losses from leakage, condensation and radiation were carefully estimated and the water evaporated carefully measured. The results obtained are given in the following tables (marked I and II), and they are certainly startling:

TABLE I.

STEAM CONSUMPTION OF THE "MINNEAPOLIS."

An estimate of the average weight of steam used per hour by the machinery in use is as follows:

	Total pounds of steam per hour.
Main engines, port and starboard	31,939.8
Condensation in main engine jackets, estimated	750
Condensation in main steam line, estimated	450
Loss of steam from unavoidable leaks, estimated	480.8
Total	33,620.6

Assumed as one-half the total loss of feed water per hour.

AUXILIARIES.

Main air and circulating pumps	2,641.9
Bilge pumps (three)	1,291.2
Steering engine, estimated	450
Main feed pump	951.1
Pump for washing decks, ash hoists, galley coppers, shop engine, etc	240
Dynamo	2,023.3
Flushing pump	275.7
Blow in evaporator room, and combined salt and fresh water pump for distilling plant	46
Steam to evaporators for distilling (average of 1,500 gallons per day)	651
Ship's ventilator blowers (two after)	549.5
Ship's ventilating blowers (two forward, 12 hours per day)	274.7
Ice machine	422.5
Miscellaneous (shifting dynamos, etc.)	30
Condensation in auxiliary steam line (estimated)	300
Total auxiliaries	10,146.7

Hood's Merthyr coal was burned, there being three main double-ended boilers in use.

DIMENSIONS OF EACH BOILER.

Length, feet	20
Diameter, feet and inches	15 9
Furnaces, number (corrugated)	8
Furnaces, diameter (least), inches	40
Furnaces, diameter (greatest), inches	42⅝
Length of grates, inches	84
Tubes, number	1,268
Tubes, diameter, inches	2¼
Tubes, length between tube sheets, inches	87¾
Tube heating surface, square feet	5,540
Plate heating surface, square feet	861
Total heating surface, square feet	6,401
Grate surface, square feet	186.7
Ratio grate surface to heating surface	1 to 34.29

RESULTS.

Average boiler pressure, by gage	142
Coal consumed per hour, pounds	5,215
Coal consumed per hour, per square foot of grate, pounds	9.31
Refuse per hour, pounds	637.5
Percentage of refuse in coal	12 22
Total steam used per hour, all machinery pounds	43,767.3
Pounds of water vaporized per pound of coal (average temperature of feed 85 per cent)	8.39
Equivalent evaporation per pound of coal from and at 212 degrees	9.89
Percentage of daily coal consumption to run main engines only	76.82
Percentage of daily coal consumption to run auxiliary machinery	23.18

It will be seen that the average weight of steam used by the main engines per hour was 33,620.6 pounds and by the auxiliaries 10,146.7 pounds. That is, the auxiliaries consumed nearly 25 per cent of the total coal used. The main engines consumed an average of 20 83 pounds of steam per indicated horse-power per hour, and the auxiliaries an average of 119 pounds per indicated horse-power per hour (the lowest being 55 06 pounds and the highest 318.68 pounds per indicated horse-power per hour). An examination of Table II shows that the steam consumption of the same or similar auxiliaries varied greatly, due doubtless to the varying conditions of packing rings, bearings and valves, and of the load. These results are not exceptional; in fact they are probably better than the average obtained on most war-ships or merchant vessels. The new British cruiser "Powerful" (14,000 tons displacement) is reported to have used 8,300 tons of coal from England to Hong Kong, of which 3,400 tons (or over 40 per cent) were required for the auxiliaries.

Under the most favorable conditions the auxiliaries of a large ship probably consume at least 20 per cent of the total coal and water used. This is more than twice as great as the consumption in a modern central station, and there is no good reason why as good results should not be obtained afloat as ashore.

Let us assume a required central station capacity for a first-class battle-ship of 1,000 horse-power effective at the motors. The present standard electro-motive force for naval installations is 80 volts, and for the merchant marine about 100 volts. This low voltage was originally adopted on war-ships on account of the searchlights, which require 50 volts only, and it was desired to

introduce as little dead resistance as possible. At this time no motors were, of course, in use and the electric plant was used for lighting exclusively. Such a voltage is, however, entirely unsuited for a 1,000-horse-power plant. The weight of the distribution system would not only be excessive, but the size and weight of the generators would be prohibitive. The three-wire system or a standard of 220 to 250 volts two-wire system should be adopted, using the necessary resistance in the searchlight circuits when they are in service. Since they require a relatively small percentage of the total plant capacity, and are not regularly in use, this can be done without undue sacrifice.

The generating plant should consist of several units of the same size, so that parts are interchangeable, each unit consisting of a compound vertical engine driving a pair of generators or a single generator, depending upon whether a three-wire or a two-wire system is used. Assuming an efficiency of 82 per cent for engine and generator and an average line and motor efficiency of 80 per cent, the total efficiency of the system (between the indicated horse-power of the generating engines and the effective horse-power of motors) is 65.6 per cent. In other words, to develop 1,000 horse-power at the motors will require 1,500 indicated horse-power at the engines, or about 900-kilowatt generator capacity. Six sets of 150 kilowatts each, with one in reserve, would be required. A good compound engine working at approximately full load (and with six units, those in actual service can always be operated at or near full load) will require 20 pounds of steam per indicated horse-power per hour. Assuming a total efficiency of the system of 65.6 per cent as above, it will require about 30 pounds of steam per effective horse-power per hour at the motors. If we allow 25 per cent margin for losses due to steam leakage, condensation, mechanical friction of gears, etc., we still have an economy of 37.5 pounds per horse-power per hour as against 119 pounds as shown by the Minneapolis test. In this case the auxiliaries tested aggregated 471 horse-power developed, using 56,049 pounds of water per hour. At eight pounds of water evaporated per pound of coal, the coal consumption was 7,000 pounds per hour, or 84 tons per day, assuming that this power was required for 24 hours. If the water consumption had been at the rate of 37.5 pounds per indicated horse-power per hour instead of 119 pounds, the coal used per day for these auxiliaries would have been 26.5 tons, a saving of 57.5 tons, or nearly 70 per cent.

It is fair to assume that by the introduction of compound engines and improved mechanical appliances on some of the auxiliaries, the average steam consumption can, perhaps, be reduced to 75 pounds per horse-power per hour, but this is still 100 per cent in excess of that required for the electric drive. Assuming an average daily use of 800 horse-power effective at the auxiliaries on a first-class battle-ship at sea, this difference in efficiency means a saving in water used of 360 tons per day, and in coal a saving of 45 tons per day. All steam cylinders connect with the condensers, so that the water used by the auxilaries is not lost, but is used over and over again, it being necessary to supply only that lost by leakage in the pipes and condensers. The extra pumping duty is large, however. The coal saved, on the other hand, means that with a given coal endurance (or "steaming radius") a vessel can carry from 10 to 20 per cent less coal, or, expressed in another way, with the same coal capacity she will have from 10 to 20 per cent greater steaming radius. The average price paid in the navy for coal (including stations in all parts of the world) is probably at least $7 per ton. There is therefore in the case assumed a direct saving in running expenses of $315 per day for coal alone. It may be argued that a vessel in port does not use her auxiliaries to the same extent that she does at sea, and that therefore the comparisons made are misleading. This may be true as to actual savings in pounds of coal and water or in dollars and cents, but the percentage differences hold true in any case. Furthermore, a ship is built to keep the sea, and her efficiency and usefulness are measured by her performance at sea and not when incidentally or accidentally in port. Her weights are distributed and apportioned, and her power, speed and "steaming radius" are designed for sea conditions, and it is these conditions alone which should be considered.

The weight and space required for plant are important matters, for a modern steamship, and particularly a war vessel, has every available inch of space and pound of weight carefully allotted; and it is sometimes difficult for the designers to adjust the conflicting elements (which may be equally important) so as to provide for all and still keep within the prescribed limits. The present weight of steam auxiliaries of a first-class battle-ship, assuming a total capacity at full load of 2,000 horse-power as before, is about 200,000 pounds or 100 tons. If the electric drive is used we must add the weight of the generating plant. The navy specifications limit this weight at present to one-third of a pound per watt of rated capacity. With 1,050 kilowatts capacity (six units of 150 kilowatts for service and one for spare), the weight would be 350,000 pounds or 175 tons. The electric auxiliaries would weigh about the same as steam, or 100 tons, a total of 275 tons as against 100 tons for steam drive. There would be some saving in the wiring, as against steam and exhaust pipes, so that it may be assumed that the electric plant, with the generating sets described, will weigh between two and one-half and three times the steam drive. As an offset, however, we have the saving of 10 to 20 per cent in coal required for a given steaming radius, which in a ship of this class would amount to between 200 and 400 tons. Furthermore, if in the future a satisfactory steam turbine comparable in economy with the compound engine is developed for marine work, as now seems

	No. of tests.	No. of steam cyls.	Dim. of engine. Cyl. Steam.	Dim. of engine. Diam. Water.	Stroke (full.)	Double strokes or revolutions per minute.	Duration of test.	I. H. P. of engine from cars.	Condensed steam exhaust. Per hour.	Condensed steam exhaust. Per I. H. P. per hour.	REMARKS.
			In.	In.	In.		H. M. S.		Pounds.	Pounds.	
Main starboard engine	1	3	42 / 59 / 92	.....	42	53	.....	610.85	13,973	21.237	Average of seven tests.
Main starboard engine	2	3	42 / 59 / 92	.....	42	60	.....	781.39	15,959	20.431	Average of eight tests.
Steam cylinder S. auxiliary condenser	3	1	8		12	33.20	5 21 00	1.232	328.07	266.30	Combined air and circulating pump.
Center circulating pump	4	2	10	36	6	171.6	3 07 05	18.873	1,039.14	55.06	Approximate power developed on official trial. Slide valve altered. Forward cylinder only taking steam.
Center circulating pump	5	2	10	36	6	90.0	2 49 30	4.104	310.88	75.74	
Center circulating pump	6	2	10	36	6	89.5	2 11 00	4.039	402.33	99.61	After cylinder only taking steam.
Starboard circulating pump	7	2	10	36	6	62.0	3 28 208	2.017	252.63	125.28	Indicated horse-power main engine 604.
Starboard air pump	8	2	16	31½	21	16.6	2 58 10	6.543	1,195.70	182.74	Indicated horse-power main engine 604.
Center air pump	9	2	16	31½	21	15.2	3 02 42	25.181	1,969.90	78 23	Pump loaded by opening salt feed-valve.
Starboard water-service pump	10	2	7.5	4.5	10	40.9	2 59 00	1.089	212.92	204.95	Pump used for flushing purposes.
Center fire and feed pump	11	2	12	8.5	12	12.7	3 30 45	.7851	250.19	318.68	Pump used for flushing purposes.
Center fire and feed pump	12	2	12	8.5	12	37.3	1 45 30	6.412	999.23	155.84	Pump used for washing decks.
Center fire and bilge pump	13	2	14	9	12	37.7	2 92 30	2.519	430 43	170.87	Pump used on bilges.
Main fire-room feed pump	14	2	12	7½	12	11.03	2 23 20	8.828	806.94	91.41	Pump used for feeding steaming boilers.
Main fire-room feed pump	15	2	12	7½	12	2.61	3 27 00	1.573	382 00	242.85	Pump used for feeding auxiliary boiler
Forced draught-blower engine	16	2	5	.....	4	595.3	1 23 35	16.300	1,262.30	77.44	Fire-room closed in air-tight.
							1 50 00				
Ash-hoist engine	17	2	4½	.....	4½	.....	1 24 00				
Dynamo engine No. 1	18	2	10½	.....	5	408.7	24 00 00	21.873	2,695.60	123.27	Steam pistons water-packed and bad fit to cylinders; cylinder bores rough and pitted.
Dynamo engine No. 1	19	2	10½	.....	5	424.3	1 15 40	19.598	1,787.1	88.64	New pistons with two cast-iron packing rings in each;
						417.0	1 20 10	33.601	2,293.2	68.25	in use about 10 days.
Dynamo engine No. 1	20	2	10½	.....	5	415.1	24 00 00	29.184	2,023.3	69.33	New pistons with packing rings in cylinders.
Dynamo engine No. 2	21	2	10½	.....	5	391.1	2 48 00	19.012	2,066.8	108.71	Water-packed pistons; cylinder bores rough.
						388.7	1 29 06	30.354	2,550.7	84.03	
Dynamo engine No. 2	22	2	10½	.....	5	392.0	2 02 00	16.791	1,725.0	102.73	Water-packed pistons; cylinder bores rough.
						390.7	1 33 25	26.553	2,250.0	84.74	
Dynamo engine No. 2	23	2	10½	.....	5	425.0	1 10 25	22.923	1,492.7	65.12	New pistons with packing rings; in use about nine days.
						425.0	26 25	35.237	1,989.2	56.45	
Dynamo engine No. 3	24	2	10½	.....	5	404.3	2 00 00	17.324	1,693.4	97.75	Water-packed pistons; fit cylinders closely. Cylinders in good condition.
						388.3	1 35 26	26.234	2,085.1	79.48	
Dynamo engine No. 3	25	2	10½	.....	5	398.0	2 03 45	18.241	1,488.8	81.62	New pistons with packing rings; in use about four days.
						382 5	1 44 50	27.815	2,006.5	72.14	
Dynamo engine No. 3	26	2	10½	.....	5	390.0	12 00 00	20.04	1,962.5	97.92	Water-packed pistons.
Flushing pump	27	1	8	9	12	31.7	3 11 15	1.421	275.7	194.02	
Ventilating blower engine	28	2	4	.....	3	277.5	1 59 50	.....	274.65	.....	No indicator motion fitted.
						404.3	52 30	.....	501.23	.....	
Ice machine engine	29	1	7	.....	10	73.1	5 12 05	6.024	422.38	70.12	
Workshop engine	30	1	6	.....	6	175.1	2 58 00	.....	148.05	.....	No indicator motion fitted.

TABLE II.—"ELECTRICITY ON BOARD SHIP."

probable, the weight of the generating plant will be reduced 40 or 50 per cent, and then the electric drive will compare favorably in this respect with steam, and there will still be the saving in weight of coal required for a given endurance.

The space necessary for plant must be considered as one of the vital parts of the ship, and as such it must be located below the protective deck. At first thought it may be said that it will be difficult to find the necessary space, but it must be remembered that the space required for 200 to 400 tons of coal is available, in addition to the space at present allotted for dynamo room, and these combined will certainly be more than sufficient.

The application of the electric drive to the various ship auxiliaries must be carefully studied in each case. The problems involved, however, are not more difficult than many special applications on shore, nor is there anything about them which a competent electrical engineer, with a proper knowledge of *sea conditions*, is unable to solve. The first cost will undoubtedly be greater than with the steam drive, but the savings in "operating expense," if capitalized, will much more than offset this difference in first cost.

The problem is purely an engineering one, and should be approached in a business-like way. Will the electric drive be equally safe, simple and reliable, and will it be more efficient than the present system of steam drive? This is the question in a nutshell, and I believe that the figures and data which I have presented enable us to answer it most emphatically in the affirmative. Other nations, particularly England, Germany and France, have already introduced the electric drive extensively on their ships, both in the navy and in the merchant marine; and it is earnestly to be hoped that our own navy, with its magnificent ships, officers and men, of whose record we are justly proud, will not lag behind in this important respect. Once provide the proper tools, and there need be no fear in this country that the necessary men to handle them properly will not be found.

I have not touched upon some of the minor electrical applications which have been made aboard ship, such as searchlights, range-finders, engine-room telegraphs, speed and helm indicators, signal sets, telephones, etc., etc. Some of them, such as the signal sets and searchlights, are of considerable importance both from the military standpoint and for navigation purposes, and have stood the test of service admirably. Others, like the range-finder and telephones, while of great utility, have not yet demonstrated that they can be relied upon at all times; while others still may be considered as luxuries (sometimes of doubtful utility) rather than necessities. All of them come within the province of the electrical specialist, rather than the electrical engineer, and have no direct bearing on the main problem discussed in this paper.

ELECTRIC RAILWAY NOTES.

A line of electric railroad has been projected to Cumberland and Westernport, Md. The line is to be 30 miles long and is to be completed by September next.

The directors of the newly formed Belt Line Railway Company, of Washington, D. C., have made an increase in the stock of the company to $2,000,000, to provide for improvements.

The Chicago City Council has granted to the Chicago City Railway Company a franchise to construct a trolley line in Lake avenue from Forty-seventh to Fifty-seventh street. The company will pave the street for that distance with asphalt from curb to curb.

A new street railroad company has been organized for the purpose of building and operating a street railroad between Gloucester, Mass., and Magnolia, to be propelled by electricity and known as the Magnolia Street Railway Company. The capital stock is $60,000.

The Brightwood Avenue Railway, of Washington, D. C., has changed hands and passed into the control of a new combination styled the Washington City Railway. It is reported this company will also absorb the Belt Line. The Belt Line is an old horse railroad. The Brightwood line supplies service to Congress Heights.

The street railway system of Tacoma, Wash., is to be consolidated with eastern capitalists in control. A company with $2,000,000 capital has been organized to operate all the street cars, and furnish power to manufacturers. J. P. Morgan & Company, New York, the Northern Pacific Railway, the Union Pacific and the Oregon Railway and Navigation Company are interested in the deal.

A new corporation, with a capital stock of $15,000,000, has been formed for the purpose, it is understood, of uniting all the outlying street car lines of the Yerkes system in Chicago under one management. The organization will be known as the Chicago Consolidated Traction Company, and will include all the electric roads in the county except those of the Chicago City Railway Company and those of the Calumet company.

An electric road will be built from Hudson to Albany, to be known as the Columbia & Rensselaer Railway and Lighting Company. The cars will be run by the third-rail system. The new road has taken in the Hudson Street Railway and the Kinderhook & Hudson Railway, and will construct a new road between Neverville and Albany. It will cross the New York Central and Boston & Albany railroads at Rensselaer, on a new steel bridge, 1,900 feet long. The company will also supply light and power along its route. The authorized capital is $2,000,000, and the company is authorized to use $2,000,000 more in bonds. Active operations will be started at once.

Telegraph Rates to Cuba and Porto Rico.

The Western Union Telegraph Company announces a reduction in the rates to Cuba and Porto Rico as follows, which took effect February 15:

From all points in the United States east of the Mississippi River, including also St. Louis, to Havana, 25 cents per word in place of the present rate of 40 cents.

From all points in the United States west of the Mississippi River, excepting St. Louis, to Havana, 35 cents per word, in place of the present rate of 50 cents.

To Cienfuegos, Casilda and Tunas, 20 cents more than to Havana and Jucaro, Santa Cruz, Manzanillo and Santiago, 25 cents per word more than to Havana.

To Porto Rico from all points in the United States east of the Mississippi River, including St. Louis, Mo., 75 cents per word, in place of the present rate of $1.17.

From all points in the United States west of the Mississippi River, excepting St. Louis, 85 cents per word, in place of the present rate of $1.27.

Why Eugene Field Would Like to Be a Printer.

In the "Primer," written and published by the lamented Eugene Field, the following picture of the printer is presented, and will amuse every old-time typesetter, although, perhaps, the operators of the new typesetting machines will not understand it:

"Behold the Printer. He is Hunting for a Pick-up of half a Line. He has Been hunting for Two hours. He could have Set the half-line in twenty Seconds, but it is a matter of Principle with Him never to Set what he Can pick up. The Printer has a Hard time. He has to Set type all night and Play pedro for the Beer all day. We would like to Be a Printer were it not for the Night Work."

ELECTRIC LIGHT FLASHES.

The electric light company at Hattiesburg, Miss., is experiencing a rapid growth of business.

A meeting of the stockholders of the Edison Electric Illuminating Company of Brooklyn, N. Y., will be held on February 27, to elect a board of directors.

J. H. and J. S. Culver have sold their interest in the Decatur, Ill., Gas and Electric Company to G. C. Danforth and Mr. McCoy, of Peoria, for $135,000.

The Jamaica Electric Light and Power Company has been absorbed by the Electric Company of America, a Philadelphia trust with a capitalization of $25,000,000. The capital stock of the Jamaica company has been increased to $1,500,000.

At the annual meeting of the Jamestown, N. Y., Electric Light and Power Company the following officers were chosen: President, William N. Gokey; treasurer, George F. Gokey; secretary, W. F. Bushey. The abovenamed officers, together with C. W. Grant and Edward L. Hall, compose the board of directors.

At the annual meeting of the Dover & Foxcroft, Me., Electric Light Company the following officers were elected for the ensuing year: President, C. C. Hall; treasurer, E. A. Thompson; secretary, Eugene W. Crocker; directors, C. C. Hall, James Bathgate, L. P. Evans, Frank Guernsey and D. B. Whittier.

The annual meeting of the Edison Electric Illuminating Company of New York, held on February 14, resulted in the reelection of the retiring directors. Over 64,000 shares were voted at the meeting. No action was taken bearing on the contemplated absorption of the company by the New York Gas and Electric Light, Heat and Power Company.

A damage suit for $10,000 against the Edison Electric Illuminating Company, of Baltimore, Md., was on trial in the Court of Common Pleas recently for injuries to Philip Braun, a 12-year-old colored boy, and son of the Rev. A. Brown, pastor of the Leadenhall Street Colored Baptist Church. The boy was cleaning out the gutter on the roof of Burt's hat store, on Pratt street, between Howard and Eutaw streets, June 5, 1897, when he came in contact with a wire that is claimed was not insulated, and was so badly burned on the head and arms that partial paralysis resulted.

LATEST PROGRESS IN THE APPLICATION OF STORAGE BATTERIES.

READ BEFORE THE NEW YORK ELECTRICAL SOCIETY, JANUARY 12, 1899, BY JOSEPH APPLETON.

(Concluded from page 109.)

The centralization of generating plants and their location in districts where the facilities for obtaining coal and water are good has developed the system of high-tension, alternating transmission and the distribution of direct current through rotary converters. This seems to be the one which will be employed in most of the large engineering undertakings to be solved during the next few years. The advantages of direct current for distribution over the alternating are so marked that, at least until further improvements are made in alternating-current distribution, the direct current will undoubtedly be the one most generally used. With this system of large central power-house and substations for distribution through rotary converters, storage batteries are almost essential. They reduce the size of the generating plant in the first case and also the size of the rotary converters, and enable them both to be operated with a much greater load-factor than would be possible without.

The installation of the Hartford Electric Light Company, with which you are probably familiar, was the first of this description in this country, and has proved the many advantages which were claimed for such a system.

An interesting application of this sort has recently been made on a small railroad plant in Montpelier, Vt. This plant was, I believe, the first railway plant in this country, operated exclusively from rotary converters with a storage battery auxiliary. The line operated is about nine miles long, and the substation is located about three miles from one end. The power is furnished from a power-house on the Winooski River, the current being generated by three-phase alternators at 2,200 volts. This current is carried to step-up transformers, and is raised to 6,300 volts. At this pressure it is carried to the substation, a distance of eight miles. In the substation step-down transformers reduce this to 480 volts, at which pressure it is fed into the rotary converter. The capacity of this converter is 160 kilowatts, and is especially wound for running directly in parallel with a storage battery. Its characteristic curve being similar to a shunt-wound generator, that is to say, as the load increases, its voltage would fall. By this means the battery will take care of all the fluctuations, maintaining a fairly constant load on the rotary. The battery consists of 248 cells, each containing 11 plates 10 inches square. The one-hour rate of this battery is 200 amperes. The following curves show the total current of the line, the load on the rotary and the work done by the battery. You will notice that the maximum load on the line during this time is 300 amperes. Of this the rotary carries 125 and the battery 175. The greatest amount of variation of load on the road on the rotary is 50 amperes, while the variation of load on the line is nearly 300 amperes. Such an installation shows clearly the advantages of battery regulation on a fluctuating load. The size of the rotary is reduced by practically one-half, and the load on it kept almost constant.

Most of the plants dealt with to-night have been those of a large size, supplying a large amount of energy. It must not be imagined that storage batteries are applicable only to these large stations. The results obtained from their use are just as satisfactory in the case of smaller stations, but I have referred to the larger ones to-night as being of more interest. I will, however, give the results obtained in one of the smaller type.

The Claremont Electric Light Plant, Claremont, N. H., is a small plant operated by both water-power and steam. The plant consists of two Edison bipolar dynamos running on the three-wire system and an arc light service supplied by 50 lights and Thomson & Houston dynamo. In connection with the Edison dynamos which are operating on the three-wire system, there is a battery plant of 134 cells, containing 11 plates in each cell 10 inches square. These batteries are operated directly in parallel with the Edison dynamos and relieve them of a portion of the load during the time of heaviest amount. They also help out the steam plant, enabling the water-power to be used to its fullest advantage.

Take for example the following figures for the month of January, 1896; before the batteries were installed it was found necessary to run an auxiliary engine 180 hours to supplement the water-wheel. During the same month in 1898, after the battery was installed, the same conditions as regards water-power prevailing, the station load was 33 per cent heavier and it was only necessary to run the auxiliary steam engine 133 hours during the month.

In addition to this saving, the service given was far superior, owing to the steadier pressure which was maintained. The battery has also enabled them to reduce their staff; the entire force employed in this plant now consists of a superintendent, a dynamo attendant and a lineman; the lineman also attends to the lamp trimming. Before the battery was installed there was, in addition, an engineer, while the average load was considerably less than at the present time.

The following slides illustrate the water-power and battery-room and the battery switchboard. It will be seen that this plant is not elaborate, but nevertheless satisfactory results are obtained, which show that the storage battery will result in satisfactory saving in stations of this sort, in just the same, if not a greater degree, than large modern central stations.

There is one application of storage batteries in connection with central stations which I believe will in time become very general, but which at the present time has only been tried in a few instances. It is the use of storage batteries in office buildings, stores, etc., instead of the usual isolated plant or direct supply from the central station. The method of operation is as follows:

During the few hours of maximum load at the central station, the storage battery supplies the entire current for the building, it being disconnected from the street mains. During the hours of light load, the building is connected with the street mains and the battery charged from them. By this means the central station can take as customers these buildings, and only have them on their system during the hours of light load. This is a class of customer which is not profitable for the central station in the ordinary way, as they have a large number of lamps which are only used for a short period, and that at a time when the station has its maximum load. This means that they have to provide capacity for these lamps, and yet the plant is only needed for an hour or two a day. In one installation of this sort, the electric light company say they can charge the battery at a time when they are glad to sell current for four and one-half cents a kilowatt hour, and it takes a load off their system at a time when current is worth 13 cents. This leaves a good margin for profit for both user and electric light company. The cost of such a battery plant is less than the isolated plant would be for the same capacity, and occupies very much less space, which in some buildings is an important matter. By this method the central station can also take customers having a fluctuating power load, without feeling its disturbing effect on the system, the battery maintaining an even pressure at all times. This is particularly advantageous when the fluctuating load is some distance from the power-house and the feeders are not large.

The use of storage batteries in connection with isolated plants for private houses is increasing very much. Such a generating plant without a battery requires a lot of attention, as the engine and dynamo must, of course, be kept running all the time current is required, and, moreover, runs under a variable and uneconomical load. With a storage battery, however, current is available at any time, and the generating plant need only be run to charge the battery or when an unusually large amount of current is required for special occasions. This class of work is very light on the storage battery, as usually they are only charged two or three times a week, and are only discharged for a short time every day.

The power-house is situated about 100 yards from the residence, and is 21 feet long by 16 feet wide, divided into two rooms, one for the engine, dynamo and switchboard, and one for the storage battery. The residence is wired for 300 16-candle-power lamps, and the plant consists of 19½-horse power Otto gas-engine, belted to a shunt-wound dynamo of 12½-kilowatt capacity, wound for a range of voltage 110 to 150. The storage battery consists of 60 cells, each containing 13 plates, 10½ inches square. These elements are mounted in glass jars, placed in sand trays, as shown. Plates hang on the sides of the jars, small lugs being cast on them for this purpose. The capacity of the battery is 60 amperes for eight hours, 84 amperes for five hours, 120 amperes for three hours. The switchboard is built in the partition between the battery and engine-room, so as to save space, and to allow a free access to the back of the board. Circuits are so arranged that any combination can be effected; viz., supply lamps while charging the battery, or to charge the battery alone. To supply the lamps from either battery or dynamo direct, or with the two running in parallel.

The plants that we have considered this evening will give some idea of the numerous methods of applying storage batteries to electrical work. There are many others which we might have touched upon, but the time is too short, as you will see. The field for the use of the storage battery is practically unlimited, and comprises every branch of electrical work, and the problems involved are some of the most interesting which electrical engineers have to consider.

The storage battery of to-day is a practical piece of apparatus, the days when it was considered an experiment have passed. Large sums of money are being expended in experiments to reduce the cost of manufacture and lighten the weight, and it is in these directions that the greatest improvements may be looked for.

Retail Price of Rubber-Covered Wire Advanced.

The electrical supply dealers of New York city, at a meeting held last week, agreed to advance the retail price of rubber-covered wire. Taking No. 14 wire as a basis, the price hereafter will be $9 per 1,000 feet, instead of $7. Other sizes will be advanced in proportion.

Telephone News .....and Comment

Mr. William Steese, of Sharon, Pa , has entered suit against the Bell Telephone Company for $10,000 damages for injuries received by falling through a trap-door at the Sharpsville exchange office.

The New Britain, Ct., Telephone Company has elected the following directors for the ensuing year: W. H. Cadwell, T. C. Smith, G. H. Samlow and R. L. Andrews. The directors will meet next Tuesday to elect officers. W. H. Cadwell and T. C. Smith were appointed an auditing committee.

The stockholders of the Beaver Valley, Pa., Traction Company have elected the following board of directors for the ensuing year: Dr. T. P. Simpson, A. M. Jolly and J. P. Sone, Beaver Falls; R. S. Kennedy and Dr. W. C. Simpson, New Brighton; John M. Buchanan, of Beaver; H. P. Brown, of Rochester.

At the annual meeting of the Frankfort Hill, N. Y., Telephone Company the following officers were elected for 1899: President, T. P. Parker; vice-president, George M. Russell; secretary, J. P. Abbott; treasurer, H. H. Ingham; manager, C. W. Wetmore; finance committee, John Maynard, Delos V. Brewer and George M. Russell.

The Yonkers, N. Y., Board of Health has adopted the following resolution: "*Resolved*, That the health officer be directed to compel the New York Telephone Company to thoroughly disinfect the telephone instruments in public use in this city every day by washing the same with boracic acid or some other disinfectant."

A charter has been sought from the Connecticut Legislature for a telephone company whose lines would parallel those of the Southern New England Telephone Company from Boston to New York. There would also be an extension to Philadelphia and the West. The company will be obliged to fight for its charter, however, before it obtains one.

The Northern Cambria Telephone Company, with headquarters at Spangler, Pa., has been incorporated, with an authorized capital of $10,000. The officers of the company are as follows: President, T. O. Helfrick, M. D.; vice-president, N. F. Lambour; secretary, Milton Spencer; treasurer, John S. Dumm; directors, T. O. Helfrick, M. D.; N. F. Lambour, C. Lieb, W. Deringer, W. A. Lantzy, John S. Dumm, James A. McClain. The new corporation has the privilege under its charter to operate in Cambria, Clearfield, Indiana, Blair, Somerset and Westmoreland counties.

The annual meeting of the Central New York Telephone and Telegraph Company was held in Utica a few days ago. The gross revenue for the year was $234,086.53; expenses, $189,688.73; net revenue, $44,397.80. The total number of exchange subscribers is 4,013, a gain of 387 during the year. The dividends paid during the year were at the rate of six per cent per annum on the issued capital stock. Great improvements have been made in Syracuse. A fireproof building is to be erected in Utica. New exchanges have been opened in Baldwinsville, Boonville and Lowville. New lines have been built in various directions. The following directors were elected: Warren H. Girvin and Martin A. Knapp, of Syracuse, and Lewis H. Lawrence, Charles A. Nicholson, Joseph Rudd, Robert S. Williams and Francis G. Wood, of Utica. At the conclusion of the stockholders' meeting the directors organized and elected Robert S. Williams, president; Lewis H. Lawrence, vice-president; Francis G. Wood, secretary and treasurer, and Charles A. Nicholson, general manager.

As to the Telephone Young Woman.

[*From the Brooklyn, N. Y., Eagle.*]

A letter to a morning paper says of women who operate telephones that some of them have "no conception of the responsibilities of their places;" that they are impertinent at times, and in many instances cause delays and troubles for business men. The writer thinks that young men operators are alert, and, even if not always over-polite, nevertheless seem to appreciate the needs of business men. He closes by asking, "How about this?" Well, it depends on whose experience it is, and the personal peculiarities of the man, as to "how about this?" There are young women operating at telephones who are more alert, more patient, more polite and more accommodating than other young women or than young men. There are other young women who easily get rattled, who resent the insolent rudeness of unseen and anonymous patrons and take their sweet revenge in delays and the semblance of a stupidity that they are far from possessing. Human nature is much the same in the sexes. Those of either sex who operate telephones declare it to be one of the most trying to the temper of any calling.

The Vetter Current Tap.

In the illustrations herewith are shown several forms of the Vetter current tap, a simple and useful device, combining in one a tapping plug and lamp socket. It is attached the same as an ordinary socket plug, is made for all standard bases, and is supplied in two styles, parallel and series. Where two lights or one light and a fan motor are desired to be run from one socket, the device is especially handy. For offices, residences, sick rooms, factories, physicians' operating rooms, charging storage batteries and bicycle lamps, the Vetter tap is especially convenient and useful. Mr. E. B. Meyrowitz, 104 East Twenty-third and 125 West Forty-second streets, New York city, is the manufacturer of the device.

THE VETTER CURRENT TAP.

St. Anthony Falls Power Company.

The equipment of the power-house at the lower dam of the Falls of St. Anthony, at Minneapolis, Minn., is about to be completed, and the necessary arrangements have been made by the St. Anthony Falls Power Company with the General Electric Company, which manufactured and installed the plant now in operation.

The hydraulic work and the power-house were finished in the Spring of 1898, and five three-phase alternators of 700 kilowatts each and two direct-current generators of the same capacity, with the necessary rotary converters and static transformers, were installed. The full equipment of the power-plant, as originally laid down, contemplated the use of eight alternators and two direct-current machines, of the total capacity of 10,000 horse-power. The present plant has been in full operation since May of last year, the current being used to drive the street and inter-urban railway systems of the Twin Cities Rapid Transit Company, which operates the electrical railways of Minneapolis and St. Paul.

The additional equipment will consist of three 700-kilowatt, three-phase, revolving-armature alternators, with rotary converter, step-up and step-down air-blast transformers, and switchboards for the generators and converter. The installation of this machinery will raise the generating capacity to the 10,000 horse-power originally contemplated.

A New England Electric Railway Map.

Robert H. Derrah, of the Boston Elevated Railway Company, 101 Milk street, Boston, Mass., has just completed a map showing all existing and projected street railway lines in Massachusetts, Rhode Island and Connecticut, as well as the steam roads. A glance at this map will show how one will soon be able to wend his way from Boston, or points 50 to 75 miles east and south of Boston, to New York by the electric cars via South Framingham, Worcester, Springfield, Mass., Hartford, New Haven and Stamford, Ct.

It is surprising to see the way the street railways are branching out in every direction in New England. In almost every part one may see an existing or projected street railway line. There are 2,157 miles of electric roads in the three states, and during the year 1898 some 90,000,000 car miles were run, carrying over 400,000,000 passengers.

Mr. Derrah's map is drawn to a scale of four miles to the inch, is mounted on cloth and printed in five colors. There is considerable hand work on the map. Prices may be obtained from Mr. Derrah at the above address.

We have received from the secretary, Mr. C. J. H. Woodbury, of Boston, "Transactions of the New England Cotton Manufacturers' Association," covering the semi-annual meeting held at the Crawford House, White Mountains, N. H., September 27 to 29, 1898.

OUR CHICAGO LETTER.

The ordinance of the Illinois Telegraph and Telephone Company has been vetoed by Mayor Harrison after having been passed through the City Council. In opposition to this ordinance there stands an application from the Chicago Telephone Company for the extension of its charter. President Clark, of the Chicago Telephone Company, in speaking of the application, says an extension is needed to justify the company in vast outlay which will be needed in the future. The plant cost $4,500,000, and Mr. Clark says to-day it could not be duplicated for twice that sum. The company have 16,000 telephones and these are operated by 12 separate exchanges. Fifty thousand miles of wire is used, and 30,000 of this is under ground. The original capital stock was $500,000 when the company was organized, but since then $4,000,000 of paid-up stock has been issued. Mr. Clark estimates that $1,000,000 a year for five years will be needed to continue the business on the basis it will require. The present ordinance gives to the city a three per cent compensation. The new ordinance offers a compensation of $50,000, which will be more than the city ever received. The Mayor, however, does not think the offer sufficient.

It is reported that automobiles will supplant the carettes now being used to carry passengers from the Union Depot to State street in this city. The announcement, if true, will be received with joy by a large number of people who travel over the line daily. The present busses are those of the old-time type, and the change to electric motor carriages would indeed be most gratifying.

The Tri-City Railway Company, operating electric car lines in Davenport, Iowa, Rock Island, Ill., and Moline, Ill., have been granted a 25-year franchise by the city of Moline on condition that the company purchase the Central street car line in Moline, give an up-to-date service, a five-cent fare, transfers to all parts of Moline and Rock Island, and to have their cars equipped with vestibules, fenders and electric heaters.

At Streator, Ill., C. C. Barr recently purchased the street car system. The council have given him a 35-year franchise. The line will be improved by several extensions.

F. E. C.

Chicago, February 16.

Mr. S. Dana Greene has been promoted to be general sales manager of the General Electric Company.

ITEMS OF INTEREST.

The Crehore-Squier Company, of Cleveland, Ohio, capital $1,000,000, has been organized to exploit the "sine wave" system of telegraphy of that name. One of the incorporators is Harry A. Garfield.

The American Electrical Vehicle Company, of Chicago, has closed a contract to supply pleasure vehicles for several Bombay princes. The orders aggregated $26,000, and the vehicles will be shipped during the early Summer.

The stockholders of the Buffalo, N. Y., General Electric Company voted recently to mortgage the company's property to secure $2,400,000 worth of five per cent 40-year bonds, to be issued in lieu of the corporation's present bonds, pursuant to the plan adopted for the refunding of the present bonded indebtedness.

The Western Union Telegraph Company and the Commercial Cable Company announce that from March 1 the cable rate to points in Holland and Belgium will be the same as to Great Britain, Germany and France, or 25 cents a word. This is a reduction of seven cents a word to Holland and five cents a word to Belgium.

The Chicago, Harvard & Lake Geneva Electric Railway has been incorporated at Chicago with $150,000 capital stock. The incorporators are H. H. Windsor, H. T. Windsor, C. N. Bates, C. T. Bundy and L. C. Church. H. H. Windsor was elected president, C. N. Bates vice-president, H. T. Windsor secretary and treasurer. C. T. Bundy was appointed attorney for the road and H. T. Windsor general manager.

It is understood that Governor Roosevelt will favor the establishment of a state electric light plant at the Capitol, at Albany, N. Y., provided such a new departure can be made for less money than the present system requires. Capitol Commissioner Perry once estimated that the state could run its own plant for $10,000 a year, whereas recently it has cost about $48,000 annually to illuminate the Capitol.

Another new use is to be made of electricity by the Atchison, Topeka & Santa Fe Railroad. This company is now arranging to illuminate its switch lights with incandescent lamps. A Chicago electrical company has been given a contract to take out all of the oil burners in the switches in the big Topeka, Kas., yards, and replace them with incandescents. The change will be made just as soon as the electrical plant, which is now being put into the shops of the company at this point, is ready for business. In addition to the change in switch lights, 10 of the new locomotives that are now being built for the company have been ordered furnished with electric headlights.

All the small electric lighting and power companies in the Borough of Queens, N. Y., will soon be absorbed, it is asserted, by the Electrical Company of America, organized under the laws of New Jersey, with a capital of $25,000,000, and having its headquarters in Philadelphia. One of the latest acquisitions of this company is the Electric Light and Power Company, of Jamaica. The stock of this company has been increased to $1,500,000, about five times the original amount. With this company as a nucleus the American company anticipates spreading out over the entire borough.

The Fowler Switchboard and Telephone Company, of 253 Broadway, New York city, has applied to the Supreme Court for the voluntary dissolution of the corporation, and Justice Bookstaver has set down the order to show cause for May 2. The directors are Samuel B. Fowler, John T. McRoy and L. Victor Fleckles. The company was incorporated on November 14 last, with a capital stock of $5,000, to manufacture and sell telephone switchboards. There are no creditors, and the company has property worth $400, consisting of tools. In the capital stock account there is a balance of $500 on deposit in a Brooklyn bank, and agreements of assignment of patents by S. B. Fowler valued at $2,000 and services rendered by V. L. Fleckles valued at $1,000.

A bill granting extraordinary powers to the Astoria Light, Heat and Power Company, of Queens County, has been introduced in the New York State Legislature by Assemblyman Mazet, of New York. The bill authorizes the company to supply gas and electricity to New York city, which may be conducted under and across any and all waters separating the borough of Queens, Manhattan and the Bronx. Conductors, mains and pipes for the purpose of supplying gas and electricity may be laid under and across the East River or any intervening land belonging to the state, the city, or any private person at such places as it may determine; provided, however, that such mains and pipes shall not be laid so as to impair navigation, commerce, or anchorage in any of the navigable waters crossed.

Cutting the Manila Cable.

Attorney-General Griggs, in an opinion rendered on February 4, held that the British Extension, Australasia & China Telegraph Company has no ground for a claim to indemnity because of the cutting of the cable at Manila in May last by Admiral Dewey. The cable company has filed with the State Department a claim for $36,000 damages, and it was on this claim that the Attorney-General's opinion was asked. Attorney-General Griggs says:

"Property of a neutral, permanently situated within the territory of an enemy, is, from its situation alone, liable to damage from the operations of war, which this cutting is conceded to have been, and no compensation is due for such damage. It is said that the whole utility of the cable is destroyed for many miles by a cutting within territorial waters; in other words, that the damage extends outside of territorial waters. But is this true? Undoubtedly the interruption to traffic over it does or may extend many miles, but the interruption of the traffic is not the basis of the claim. When repaired, it was repaired, as it had been cut, within territorial waters, and was then the same as before the injury. It was possible to take up the outer bed and operate the cable to Hong Kong from the time it was cut; and it was the sealing of the cable at Hong Kong and not the cutting that prevented this from being done. It seems to me, therefore, that the injury by cutting can properly be regarded as in no way withdrawn from the rule by reason of the supposed extension beyond territorial waters, even if an extension of the injury could, in any case, alter the rights of the belligerent.

"The obvious difference between a cutting within and a cutting without the territorial water, however it may be troublesome to the owner, goes to the foundation of the rule authorizing the destruction of property because it is within the territory. It is equally troublesome to the owner of any property to have it injured or destroyed in or out of the enemy's country. This, however, does not affect the belligerent's rights with regard to his property within the enemy's country. To say that the American Admiral desired to use the cable himself, as well as to prevent the Spanish Government from using it, is but to attribute to him a motive in addition to one which justified his act. This can in no way diminish the right to cut the cable, nor, seeing that he did not use it, can it give rise to any different rule as to compensation.

"I am of the opinion, therefore, that upon the law of the case there is no ground for the claim to indemnity."

Frederick K. Boomhower, of Chateaugay, has been appointed assistant electrical engineer at the Auburn, N. Y., state prison.

ADVANCE INFORMATION

New Telephone and Telegraph Companies.

FORDSVILLE, KY.—A new telephone company has been formed at this place, with a capital stock of $1,000.

CLEVELAND, OHIO—The Crehore-Squier Company, of this city, has been incorporated, with a capital stock of $1,000,000, to conduct a telegraph business.

CHICAGO, ILL.—The Illinois District Telegraph Company has been incorporated; authorized capital, $100,000; incorporators, F. H. Tubbs, E. M. Mulford, W. J. Lloyd.

SCHUYLER, N. Y.—A movement is on foot to establish a telephone line in this town.

LONDON, OHIO — The London Telephone Company has been incorporated to build and operate a telephone line in this place; authorized capital, $30,000; incorporators, Ed. L. Barber, James S. Brailey, Jr., R. W. Boyd, J. L. Hauer, A. J. Heintzelman.

PRINCETON, MO.—The Lineville Telephone Company has been incorporated; authorized capital, $2,000; incorporators, W. P. Sullivan, M. E. Sullivan, H. G. Orton, J. B. Hyde, E. T. Hyde.

MAYSVILLE, KY.—The Germantown, Minerva & Maysville Telephone Company has been incorporated; authorized capital, $500; incorporators, M. C. Russell & Son, Brittian & Loyd, T. C. Winter, Frank Owen Hardware Company, White, Judd & Company, and others.

ROGERSVILLE, TENN.—The Tennessee River Telephone Company has been incorporated; authorized capital, $1,000; incorporators, J. R. Roark, T. R. Webster, R. D. Keller, J. R. Sanders, J. D. Walker.

DUQUOIN, ILL.—The Duquoin Telephone Company has been incorporated; capital stock, $16,000; incorporators, R. A. Youngblood, F. H. Stamper and H. H. Onstott.

WILMINGTON, OHIO—The Wilmington Home Telephone Company has been incorporated with $15,000 capital stock. The company is authorized to construct or acquire and operate telephone lines in Ohio. Miletus Garner, S. R. Mitchell, C. R. Fished, L. J. Walker and S. G. Smith are the incorporators of the company.

TILTON, N. H.—The Tilton & New Hampton Telephone Company has been incorporated; authorized capital, $1,000; incorporators, G. H. Davis, D. D. Davis, L. E. Merrill, J. Collins, G. A. Collins.

CHARLESTON, W. VA.—The Kanawha & New River Telephone Company has been incorporated; capital, $25,000; incorporators, M. T. Davis, J. O. Dickenson, E. Carver, J. C. Newman, N. R. Coles.

CAMERON, MO. — The Cameron Telephone Company has been incorporated, with a capital stock of $10,000; incorporated by E. C. Baker, S. D. Thompson, John M. Thompson and others.

New Electric Railways.

SALEM, N. Y.—The Greenwich & Schuylerville Electric Railroad, in which Joseph A. Powers is the principal stockholder, has been granted a franchise to operate its road through the streets of Greenwich.

BETHLEHEM, PA.—The Bethlehem & Nazareth Passenger Railway Company has been incorporated, with a capital of $60,000, and will build and have in operation by Fall a trolley line of 10 miles connecting these sister Moravian towns. The projectors are local capitalists, and they have chosen Joseph J. McKee, of this place, president. An ordinance granting rights to the company was passed February 7 by the Nazareth Town Council.

KENOSHA, WIS.—It is reported here that a company is being organized in this city for the purpose of building an electric railway from this city to the little village of Pleasant Prairie, six miles west of this city. Vice-president Isaac Bishop, of the Milwaukee, Racine & Kenosha electric line, is said to be interested.

SOUTH BEND, IND.—The County Commissioners have granted a franchise to the local street railway company to build a line to Niles, Mich., thus connecting five important cities.

CUMBERLAND, MD — The stockholders of the Cumberland, Frostburg, and Lonaconing-Westernport electric lines, to extend 30 miles through the Cumberland mining region and to cost $550,000, have elected the following officers: President, E. F. Walker, Philadelphia; vice-president, J. W. Burchinal, Moundsville, W. Va.; secretary, Geo. D. Howell, Philadelphia; treasurer, Frank B. Sweeten, Camden, N. J.; I. Engle Cochran, Jr., Chester, Pa., and Isaac A. Walker, Philadelphia, were chosen general directors, to cooperate with local directors.

KANSAS CITY, MO.—The Missouri Electric Railway Company has been incorporated; capital stock, $500,000; incorporated by Henry Smith, Frank W. Sears, Chett McDonald, A. J. Lightner and others.

XENIA, Ohio—The Xenia & Spring Valley Transit Company, to build and operate an electric railway between this place and Spring Valley, has been incorporated; authorized capital, $5,000; incorporators, C. J. Ferneding, O. O. Ozier, J. M. Wilson, H. L. Terneding, Philip A. Kemper.

Electric Light and Power.

NORTH BRADDOCK, PA.—The North Versailles Township Light and Power Company has received its charter of incorporation. The officers of the company are E. W. Boyd, president; Homer L. Castle, vice-president; Grant Williams, treasurer; Anthony Lewis, secretary, and D. A. Powell, solicitor. The directors are J. D. Stewart, James Carson, D. K. Haster, W. J. Redfern, W. D. Brush, N. McIntosh, H. L. Castle, M. H. Leonard, E. W. Boyd, W. C. Hill and C. H. Snyder. The company has been capitalized at $15,000.

CHICAGO, ILL.—The Cook County Light and Heat Company has been incorporated; capital stock, $50,000; incorporators, John Cameron, Warren A. Drake and Charles C. Holter.

MEMPHIS, TENN.—The Iowa Vapor Light Company has been incorporated. The incorporators are S. M. Powell, W. B. Malone, F. M. McGlathey, C. H. Bright and E. A. Moore; capital stock, $4,000.

AKRON, OHIO—The Washington Lighting Company has been incorporated; capital, $40,000; incorporators, W. A. Green, E. I. James, H. L. Snyder, E. J. Creffield, W. Phillipson.

New Incorporations.

SAN FRANCISCO, CAL.—The Yuba Electric Power Company has been incorporated; authorized capital, $1,000,000; incorporators, R. R. Colgate, New York; J. Martin, W. F. Pierce, W. M. Pierson, J. Williams.

AKRON, OHIO—The Washington Light Company, manufacturers of a compressed petroleum light, has been incorporated.

CLEVELAND, OHIO—The Crehore-Squire Intelligence Transmission Company has been incorporated, to own and operate, and license others to use and operate apparatus and appliances for transmission of intelligence by means of electricity; authorized capital, $1,000,000: incorporators, W. R. Warner, Ambrose Swasey, Albert C. Crehore, George O. Squire, H. A. Garfield.

CAMBRIDGE, N. Y.—The Cambridge Electric Energy Company has been incorporated; authorized capital, $25,000; incorporators, Nathan H. Barton, John C. Buskett, H. A. Patterson, H. O. Barber, William C. Benbow.

Increase of Capital.

HARTFORD, CT.—The Eddy Electric Manufacturing Company has increased its capital stock to $1,500,000.

LANSING, MICH.—The Detroit & Pontiac Railway Company has increased its capital stock from $400,000 to $500,000.

Philadelphia Electrical Firm Burned Out.

A fire in the building on New street, near Race, in Philadelphia, on February 8, burned out the Technic Electric Company, whose loss is placed at $20,000.

HUMOR FROM THE DAILY PRESS.

UNTRAINS, UNTROLLEYS, UN-JONES.

[From the New York Sun.]

Jones lives in Jersey. Jones is a man of wide experience in the newspaper world, particularly that branch of it that has to do with the cable service. If there is one thing in this world that will make a man sparing of his words it is such experience as Jones has had. When Jones left his home in Jersey yesterday morning he struggled for hours against the howling wind and the driving snow. He cussed the trolley railroad magnates and cussed the steam railroad magnates. He finally cussed nature and decided that his newspaper would have to get out without his assistance.

In the science of word-saving as practiced by experts "un" hitched to the forward end of another word negatives it and saves cable tolls on one word. This is Jones's announcement by telegraph to his paper:

"Untrains, untrolleys, un-Jones."

By the way, he got there later.

ELOPEMENT A LA MODE.

[From the Chicago Daily Tribune]

The agitated girl looked back through the cloud of dust that rose in their rear.

"Algernon," she exclaimed in terror, "papa is pursuing us!"

"Let him pursue!" chuckled Algernon. "The last thing I did before we started was to slip out and change his storage battery. It's only got about one more mile in it and then it'll stop dead."

And even as Algernon spake these words his automobile drew away from the pursuer, while from the lagging machine far in the rear came faintly to the ear hoarse cries of impotent rage from the baffled parent.

THIS COMMUTER HAD TIME TO BURN.

[From the New York Evening Sun.]

A Long Island Railroad commuter eagerly boarded a train at Richmond Hill this morning, the only one that had pulled in for hours, consisting of a locomotive in front of a coach and a locomotive behind. It ran 300 yards and then brought up against a snow-bank as high as the smoke-stack. "Do you think," asked the commuter of the conductor, "that I shall have time to go back and telephone?" "——," said the conductor, "you will have time to build a telephone line."

An electric railroad between Metamora, Mich., and Toledo, Ohio, is being projected.

Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED FEBRUARY 14, 1898.

619,263 Carbon clamp for electrical purposes; J. F. Bachmann, Vienna, Austria—An electrode, a conductor extending therethrough and secured directly thereto, a body of mercury confined within the electrode and surrounding said conductor, and means for securing a circuit wire to the conductor.

619,269 Electrical transmission of sound; E. M. Bell, New York, N. Y.—An apparatus for transmitting sounds, consisting of a sound receiver, a balanced beam arranged in operative relation with the sound receiver and carrying a resistance, a point contacting with the resistance, a lamp in circuit with the resistance, and a receiving circuit provided with a resistance variable by light.

619,276 Signal recording apparatus; W. L. Candee, New York, N. Y.

619,287 Electric railway; J. B. Entz, Philadelphia, Pa.—Means for operating motor cars from each end of a train, which comprises a train conductor system or circuit, and identical controllers on each motor car provided respectively with devices for arranging the motors and train conductor circuit or system in fixed combination on the rear car to drive the train forward, and with devices for connecting the train conductor circuit or system trolley conductor, and motors and their accessories in variable combinations on the front car.

619,293 Prepayment electric fan motor; W. C. Fish, Lynn, Mass.

619,296 Dynamo-electric machine; S. S. Forster, Schenectady, N. Y.—Consists of a dynamo, a split-hub spider with an integral collecting device secured to one side only of the spider.

619,299 Retaining band for commutators; J. R. Grindrod, Lynn Mass.—A plurality of commutator segments assembled in annular form and wholly or partially finished and provided with a wire retaining band, and a mechanical clamp for securing the ends of the wire which is disposed at an angle to the plane of the segments, so as not to unduly compress the segments at that point.

619,302 Two-rate meter; C. D. Haskins, Newton, Mass.—Consists of field coils, the current in which is dependent upon that flowing in the metered circuit, an armature connected across the supply mains, and automatic means for varying the resistance of the armature circuit.

619,307 Electric motor; T. D. Hollick, London, Eng.—An armature shaft, two separate armatures, the main armature having a greater length than diameter, mounted thereon, and a field magnet movable with relation to the armatures to surround one or a portion of both armatures.

619,314 Electrical heater; C. W. Jones, North Temescal, Cal.

619,324 Battery switch; R. Macrae, Jersey City, N. J.

619,329 Steering apparatus for vessels; T. W. Moore, New York, N. Y.—Consists of the hull, an exterior steering-wheel, located at one end, below the water level, with its axis parallel with the keel, and with a part covered by a hood and geared with a motor for rotating it in either direction.

619,349 Process of and apparatus for extracting precious metals from ores or slimes; Hugo Riecken, London, Eng.—Consists in causing mercury to descend in a thin film over a metallic surface forming a cathode, agitating the pulp, dissolving the precious metals by passing a current through the pulp to the cathode, and depositing them in an adherent layer upon the cathode.

619,360 Insulating alternating-current circuits; C. P. Steinmetz, Schenectady, N. Y.—The art of eliminating air from an insulating compound ordielectric, which consists in substituting a vaporizable compound for the occluded air, and then vaporizing the compound so that the air is carried away by the change of tension.

619,406 Railway signal system; Chas. Hansel, New York, N. Y.

619,410 Telegraph key attachment; A. J. Hendricks, Crockett, N. Y.

619,440 Duplex-faradic battery; J. H. Robertson, New York, N. Y.—An induction coil differentially wound, an armature influenced by two electro-magnets, and adapted to make alternate contact with two points, each of which said two points is in circuit at intervals with an electro-magnet and a primary wire of an induction coil.

619,448 Electric burglar alarm; J. Tomney, New York, N. Y.

619,449 Electric-protective system; J. Tomney, New York, N. Y.

619,465 Electrical switch; A. Brier, Manchester, Eng.—An electrical switch, resistance means, a movable contact, operating means therefor and a connection from the switch to the said operating means to move it into or out of operative condition.

619,471 Electric branding device; B. Fellowes, New York, N. Y.—An apparatus for branding a variable design upon a surface or fabric comprising a series of characters formed of metal and provided with connections for cutting them into an electric circuit, and means for adjusting them into various relations to vary the design to be branded.

619,476 Mechanical time switch for two-rate electric meters; J. H. Gerry, New York, N. Y.

619,493 Telephone attachment; F. Lind, Jr., Paterson, N. J.

619,519 Electric branding device; H. Van Hoevenbergh, New York, N. Y.

619,555 Telegraph insulator; I. B. Frantz, Allenport, Pa.

619,620 Electric motor; C. L. Rosenqvist, New York, N. Y.—An alternating or pulsating-current motor having two field magnet circuits mounted upon a common core, and means for rectifying the current in one circuit to maintain a constant field magnetism, only one circuit being active at a time.

619,621 Alternating-current electric motor; C. L. Rosenqvist, New York.

619,622 Secondary battery; A. Schanschieff, London, Eng.

619,636 Apparatus for separating magnetic materials; O. A. P. Trustedt, Stockholm, Sweden.

619,662 Telephone signaling system; D. M. Bliss, Brookline, Mass.

619,667 Electric printing machine; G. L. Campbell, Dushore, Pa.—Comprises a frame having paper-carrying rollers mounted thereon and means for traversing the frame, positive means acting upon one of the paper-carrying rollers to rotate it, a spring held locking means acting upon the other roller, and a lever adapted to engage the latter roller to give it a partial rotation.

619,679 Galvanometer; A. A. Dittmar, Jersey City, N. J.

619,687 Electrical sign; W. A. Harvey, Scranton, Pa.—Consists of an insulated base, a series of parallel conductors supported thereon, and a plurality of lamp holders having grooved edges to engage the adjacent edges of any pair of conductors.

BUSINESS NOTES.

The National Automatic Telephone Company, Chicago, have lately installed new exchanges at Lyons, Kas.; Great Bend, Kas., and Kinsley, Kas. The plant at Wilson, Kas., is very nearly completed. This company is meeting with a ready sale of improved automatic 'phones and switches, and is busy filling orders.

The Eureka Electric Company, Chicago, are building a new three-story factory, floors 50 by 80 feet. This gives them greatly increased facilities to handle their business. They have lately placed on the market a new magneto bell; the contacts used are platinum. The bell is well made, fully nickled, and is claimed by them to be one of the best in the market.

The Central Electric Company, Chicago, by a shrewd business move, are enabled to quote all comers very attractive prices on copper wire. The price of copper has very materially increased during the last month, and is constantly soaring higher. It would be well for those contemplating the purchase of magnet, annunciator, office or weatherproof wire to get the Central Electric Company's prices.

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Kindred.... ...Interests

The power and mining department of the General Electric Company has now under construction 12 electric locomotives for domestic use.

The American Impulse Wheel Company, of New York, report some very large electric transmission work in hand and most valuable results from all their installations. The company are getting a large home and export trade.

The Crofton Storage Battery Company, Chicago, have moved into new quarters at 329 Dearborn street. They will occupy the entire first floor in this building. Jas. K. Pumpelly, the former manager, has absorbed all the interests of the company, and, as owner of the patents, will conduct the business hereafter in his own name.

The American Electric Vehicle Company, Chicago, have received an order from Bombay, India, for electric carriages. The order amounts to something over $26,000. They are to be shipped as soon as completed to several princes who wish to while away their idle hours in this up to-date method of getting around the town.

"Holy Angels"—We have just received from the publishers a copy of the aboved-named beautiful religious reverie, suitable for piano or organ, composed by George D. Wilson. The retail price of this piece of music is 60 cents. All our readers will receive a copy of it by sending 25 cents in silver or postage stamps to the Union Mutual Music and Novelty Company, 20 East Fourteenth street, New York.

The Eureka Electric Company, of Chicago, have in course of manufacture and will have ready for the market shortly what is claimed to be absolutely the finest magneto bell ever placed upon the market. The contacts used throughout are platinum, the bell is full nickeled, ringer coil of the W. E. style and the generator most highly finished. This instrument will be ready about February 15.

Their new No. 44 transmitter is meeting with a most ready sale and is giving very fine satisfaction. The new transmitter is constructed on scientific experience, and is built for lasting qualities and good service.

George Gould on Electricity for the Elevated Roads.

Mr. George Gould last week made public the following statement:

"The public has very little idea how thoroughly the management of the elevated roads has investigated the subject of electrical power. The investigations which have been conducted during the last year, relating to a change of motive power, have embraced the generation, distribution and use of electrical power on both elevated and surface roads by every important plant in this country, particularly those in New York, Brooklyn and Chicago. The reports, therefore, furnished to our company represent the combined experience of the largest producers and consumers of electricity in the world.

"The results are something marvelous. The most careful and conservative estimates made by experts show a saving of two and one-half cents a mile on the entire car mileage of the elevated roads. As we are now running over 40,000,000 car miles a year, the saving in operating expenses alone will be over $1,000,000 per year, which, with other economies possible, is sufficient to pay five per cent on the new capital which it is proposed to the stockholders to put into the elevated roads and one per cent additional on the present capital; in other words, to put the whole property on a sound five per cent basis."

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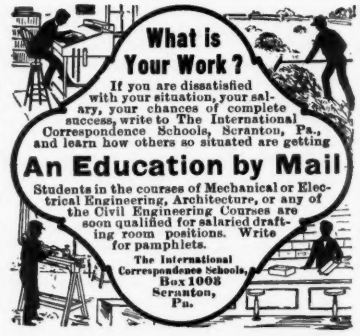
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